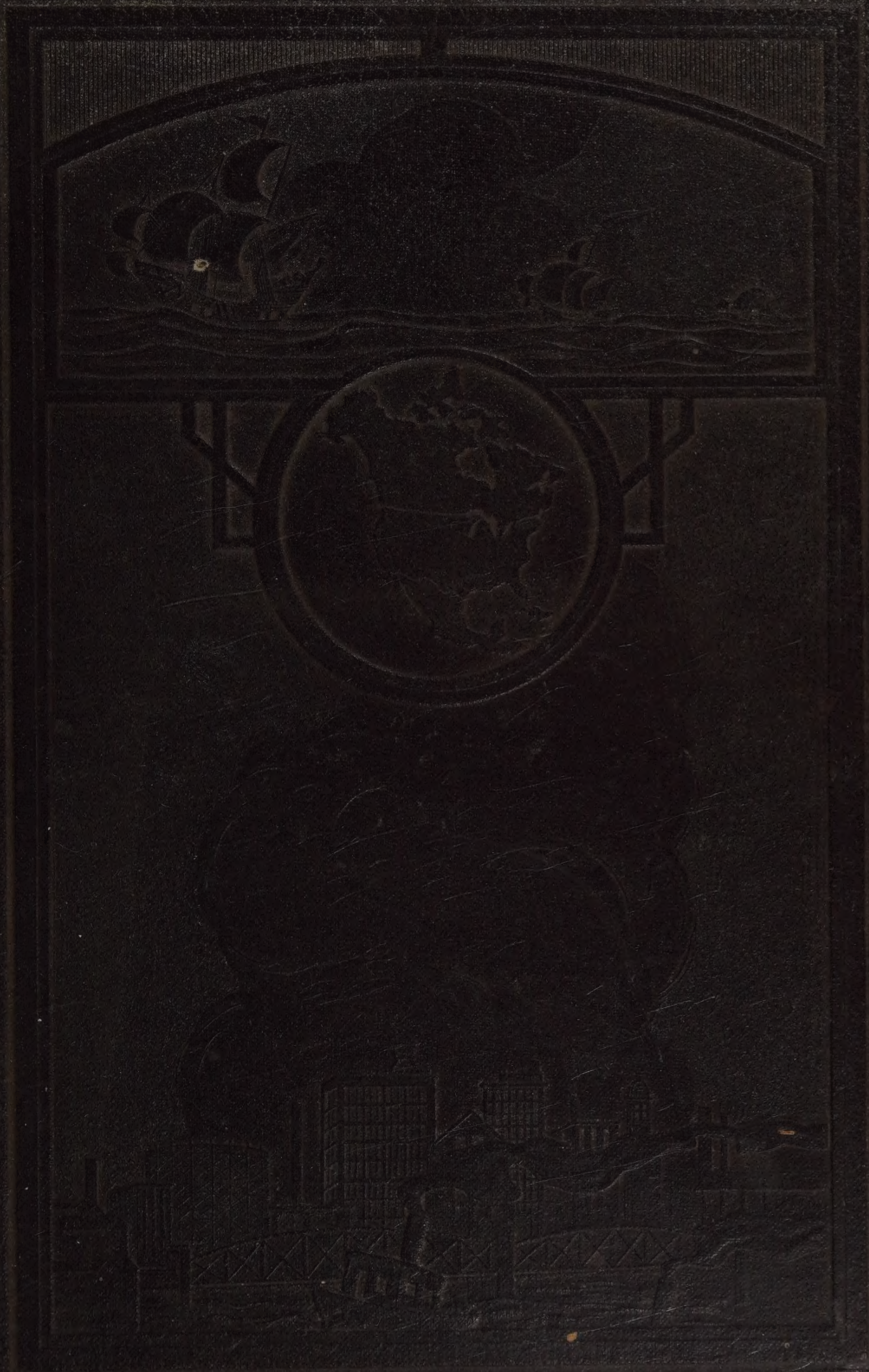

THE DOMINION EDUCATOR

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VOLUME THREE

DANCING, *dan'sing,* a form of exercise, accompanied almost always by music, in which the participants perform graceful movements in measured time. In its earliest forms among primitive races, dancing was a mode of expressing strong emotions of joy and sorrow, love and rage, and even of the most solemn and impassioned religious feelings; in more civilized forms of human society it becomes a pleasurable form of recreation or an agreeable spectacle at public entertainments.

Dancing corresponds to a universal primitive instinct in man. It is still practiced by the South Sea Islanders, the forest Indians of Brazil, the Zulus, the negroes of Central Africa and the native Australians, exactly as it was in the earlier stages of every civilized modern race. Ferocious war dances were practiced by savage warriors, as, for example, the North American Indian braves, who worked themselves up into frantic mechanical intoxication, capable of carrying them irresistibly on to victory.

Among the ancient historic peoples dancing was generally an expression of religious, patriotic or military feeling, as in the case of the dance of David before the ark, or the Pyrrhic dance of the Greeks. The Romans, however, like the Orientals, hired slaves to do the dancing. France took the lead in inventing modern dances. Among some of these dances were the graceful *minuet,* the favorite for a century; the *quadrille;* the *galop,* introduced from Germany; the *cotillion,* fashionable under Charles X; the *polka,* first danced at Odeon in 1840 by a dancing master from Prague; the *schottisch,* also of Bohemian origin, first brought out in Paris in 1844; the *lancers,* introduced by Laborde in 1836, and the *waltz,* introduced into European ballrooms in 1795. This graceful dance will probably never lose its popularity. Another favorite is the *two-step,* a livelier dance than the waltz and one adapted to march time. It is of American origin.

Characteristic of particular races or merely of classes of people are such forms of the dance as the Scotch *reel, Highland fling* and *strathspey;* the Irish *jig;* the negro *breakdowns;* sailors' *hornpipes,* and the like.

So-Called "New" Dances. For a few years after 1911 a dance craze swept over America and Europe, following the introduction into San Francisco of the turkey trot. For a time people were dancing this and others like it—the bunny hug, grizzly bear, Texas Tommy, etc.—but the vulgarity of these dances caused a reaction against them, and others more refined in character became popular. The latter included the tango, one-step and fox trot, based on walking steps, and the hesitation and waltz canter, based on the waltz.

DAN'DELION, a plant which carpets lawns and meadows with bright yellow in the spring, summer and fall. The leaves are toothed, radiating from the crown of the very long root, and the name is from the French for *tooth of a lion.* The dandelion blooms profusely, bearing many slender stalks, each surmounted by one large, bright yellow head of many small flowers which mature into a beautiful white ball of feathered fruits. These are transported far and wide by the wind. The whole plant is full of a milky and bitter juice. Some species have powerful medicinal properties, and the young leaves of all are often used for greens and salads.

DANDELION

DAN'DRUFF, the visible effect of a disease of the scalp. It appears as a white, scaly substance which loosens from the scalp in small particles and either adheres to the hair or falls on the clothing. The presence of dandruff gives rather positive assurance that in time the disease will cause the hair gradually to fall out. The best remedy is a vigorous daily scalp massage and an occasional shampoo, in which pure soap is used.

DANIEL, the prophet, a contemporary of Ezekiel, was born of a distinguished Hebrew family. His story is related in these volumes in the article BIBLE, subhead *Bible Stories.*

DAN'IELL BATTERY, a galvanic battery, the cells of which were originally constructed as follows: A tall cylindrical copper vessel was nearly filled with a strong solution of sulphate of copper (blue vitriol). A rod of amalgamated zinc was enclosed in a skin or bladder, which was filled with dilute sulphuric acid and was suspended in a copper cylinder. When the zinc rod was connected by wire with the copper vessel, the current passed from the copper through the wire to the zinc.

The modern Daniell battery consists of a glass jar in which is placed a porous cup containing zinc. This cup is enclosed in a copper cylinder having an opening on one side for the free circulation of the liquid. Dilute sulphuric acid is placed in the cup containing the zinc, and a solution of sulphate of copper is placed in the jar. A small porous vessel filled with sulphate of copper is also placed in the jar, to maintain the strength of the solution. The sulphuric acid in the porous cup unites with the zinc, and the copper sulphate in the jar is decomposed and deposits its copper on the copper cylinder. These chemical changes produce a current of electricity which flows from the copper to the zinc. The Daniell battery in various forms is in general use in telegraph stations and for other purposes where a battery producing a low current is desired.

DANISH WEST INDIES, the name formerly applied to the Virgin Islands of the United States (which see).

DANTE ALIGHIERI, *dahn'ta ah le gya're,* (1265–1321), Italy's most famous poet, and one of the greatest who ever lived. He was born in Florence of a family which probably belonged to the lower nobility.

Of his youth and education nothing definite is known, although it may be that he studied with the learned Brunetto Latini. He was but a boy of nine years when he first saw Beatrice Portinari, and the love she awakened in him he has described in that record of his early years, the *New Life,* as well as in his later great work, the *Divine Comedy.* In 1291, the year after the death of Beatrice, Dante married Gemma Donati, by whom he had several children. Soon after this time the Guelphs in Florence became divided into the rival factions of Bianchi and Neri (Whites and Blacks), the latter an extreme Papal party, the former a moderate party which wished for reconciliation with the Ghibellines. Dante's sympathies were with the Bianchi, and when, in 1302, the opposite party gained control, Dante was banished with many of his fellows. The poet remained an exile to the end of his life; and his history during this time is semimythical. He is said to have visited many cities, Arezzo, Bologna, Sienna and even Paris, and in 1320 he certainly stayed at Ravenna, with his friend Guido da Polenta. He was buried at Ravenna, where his bones still lie.

DANTE ALIGHIERI

Dante's great poem, the *Divine Comedy,* written in great part, if not altogether, during his exile, is divided into three parts, entitled *Hell, Purgatory* and *Paradise.* The title *Comedy* was given to it, in accordance with the standards of the time, because it begins with horrible scenes and ends cheerfully. The epithet *Divine* was added by others because of its lofty character.

The "Divine Comedy." The poet dreams that he has wandered into a dusky forest, when the shade of Vergil appears and offers to conduct him through hell and purgatory. Further the pagan poet may not go, but Beatrice herself will lead him through paradise. Dante with marvelous imaginative power gives brief life histories of the famous guilty ones—Pope and Ghibelline, Italian lord and lady—often in his severe style compressing the story into two or three lines, but always picturing guilt and punishment with passionate force, subtle insight and intense religious faith. From hell, the poet, still in the company of Vergil, ascends to purgatory, where the scenes are similar, though the punishments are only temporary. In the earthly paradise above purgatory, Dante beholds Beatrice in a scene of surpassing magnificence, ascends with her into the celestial paradise, and after roaming over seven spheres he reaches the eighth, where he beholds "the glorious company, which surrounds the triumphant Redeemer." In the ninth Dante feels himself in the presence of the Divine essence, and sees the souls of the blessed on thrones in a circle of infinite magnitude. The Deity himself, in the tenth, he cannot see for excess of light. Dante's great poem ranks with the world's greatest epics, and has been translated into many languages.

DANTON, *dahN tohN′*, GEORGES JACQUES (1759–1794), one of the leaders in the French Revolution. He was foremost in organizing and conducting the attack on the Tuileries, August 10, 1792, voted for the capital punishment of all returning aristocrats and for the death of the king, and with Robespierre brought Hébert and his followers to the scaffold. Robespierre succeeded in having Danton denounced and thrown into prison because he had dared to counsel moderation, and he was afterward condemned by the revolutionary tribunal as an accomplice in a conspiracy for the restoration of monarchy, and was executed.

DANT′ZIC. See DANZIG.

DAN′UBE, the chief commercial river in Europe, second only to the Volga in length and extent of drainage basin. It originates in two small streams, rising in the Black Forest, in Baden, and uniting at Donaueschingen. The direct distance from source to mouth of the Danube is about 1,000 miles, and its total length, including windings, about 1,750 miles. From its source the Danube flows in a northeasterly direction to Ulm, in Württemberg, where it becomes navigable for vessels of 100 tons; then to Ratisbon, in Bavaria, where it becomes navigable for steamers. Here it turns in a southeasterly direction, entering Austria at Passau. It passes Vienna and Budapest, above which it suddenly turns due south, holding this direction till it is joined by the Drave, after which it runs southeasterly and enters Serbia at Belgrade. Continuing its general course eastward, it forms for a long distance the boundary line between Rumania and Bulgaria. At Silistria it once more turns northward, and flowing between Rumania and Bessarabia, it falls into the Black Sea by three different outlets.

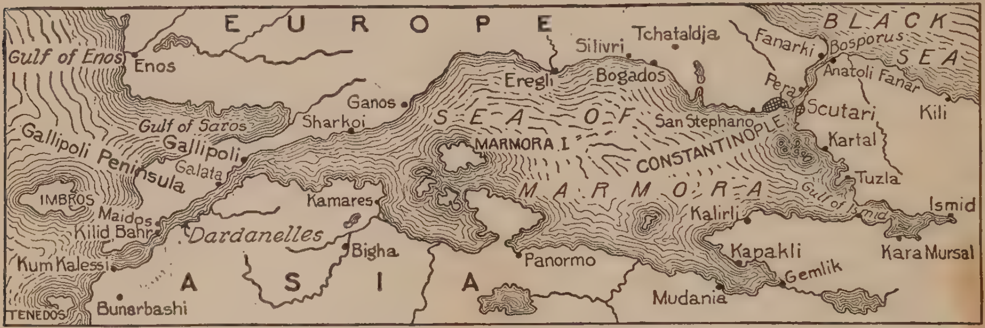
The Danube is noted for beautiful scenery along its banks, which in places rivals that of the Rhine. Its value as a commercial route has been enhanced by extensive construction work. The celebrated Iron Gate (which see), through which the river flows across the South Carpathians, has been rendered navigable, and shipping passing through it is regulated by an international commission. There is canal communication with the Rhine, and the Sulina channel mouth has been deepened to accommodate the largest ocean craft.

DANVILLE, ILL., founded in 1827, is the county seat of Vermilion County, and the center of a rich coal-mining district. It is 123 miles south of Chicago, on the Vermilion River, and on the Wabash, the Chicago & Eastern Illinois and the Chicago Southern railroads. Its industries center largely around the coal fields, but the city possesses probably the largest brick plant in the world, and there are important zinc and glass works. A Federal building was erected in 1910 at a cost of $300,000; the county building is scarcely less imposing; there is a $150,000 Y. M. C. A. building, an Elks' Home, a Carnegie Library and two hospitals. Population, 1910, 27,871; in 1920, 33,750, a gain of 21 per cent.

DANVILLE, VA., a city of Pittsylvania County, 140 miles southwest of Richmond, on the Dan River and on the Southern Railroad. The city has a beautiful location, is in a region producing a very fine quality of tobacco, is the second largest leaf tobacco market in America and contains about forty tobacco factories. The river furnishes good water power, and there are large cotton works, flour and grist mills, knitting mills, overall factories, a cheroot factory and other enterprises. It is the seat of Roanoke Institute, Randolph-Macon Institute and Danville School for Boys. The place was settled in 1792. It was for a short time the seat of the government of the Southern Confederacy in 1865. Population, 1910, 12,020; in 1920, 21,539.

DANZIG, or **DANTZIC,** *dahn′tsiK*, a free city, internationalized in 1919, by order of the peace conference. It was formerly the capital of the province of West Prussia, 255 miles northeast of Berlin, on the Vistula, about three miles from the Baltic Sea.

Among the principal buildings are the Dom or Cathedral, begun in 1343; the Church of Saint Catharine; the fine old Rathaus; the exchange; the arsenal; an observatory; three monasteries; two synagogues and two theaters. The prosperity of the town is founded chiefly on its transit trade. The principal trade is in grain, timber and sugar. There were formerly German government establishments for the manufacture of arms and ammunition. Danzig is mentioned in historical accounts as early as the tenth century. After being alternately possessed by the Teutonic knights and the Poles, the town fell to Prussia in 1795. That part of old Prussia in which the city is located is inhabited largely by Poles, and in 1919 the peace conference which closed the World War separated Danzig from German control and made the city Poland's outlet to the sea. Population, 1919, 351,380.



THE REGION OF THE DARDANELLES

DAPHNE, *daf′ne,* in classic mythology, daughter of the river god Peneus. Apollo wooed her in vain, and one day, while he was pursuing her through the woods, she called on her father to change her form, as she found herself exhausted. Peneus then changed her into a laurel tree, which was thereafter sacred to Apollo (see Laurel). There is a famous statue representing this myth in the Villa Borghese, Rome, the work of Bernini.

DARDANELLES, *dahr da nelz′,* the ancient Hellespont, is a narrow channel which connects the Sea of Marmora with the Aegean Sea and is a short part of the boundary separating Europe from Asia. It is about forty-seven miles in length and varies in breadth from one to four miles. A rapid current, often much increased by winds, runs southward. On the Asiatic side the country presents beautiful scenery, rising gradually upward from the sea to the range of Mount Ida; the European side is steep and rugged, but is densely peopled and highly cultivated. On both shores are numerous forts and powerful batteries. Two castles on the opposite shores are near the sites of ancient Sestos and Abydos, and recall the story of Hero and Leander (see Hero).

By a treaty made in 1841 between the five great powers and Turkey, confirmed by the Peace of Paris in 1856, it was decreed that no foreign man-of-war should pass the strait without the express permission of the Turkish government. During the World War the allies made desperate attempts to force a passage through the Dardanelles to Constantinople. In February and March, 1915, an allied fleet bombarded the forts at the entrance, and in April an army was landed on the Gallipoli Peninsula, but with heavy losses. The heroism of the soldiers and the sacrifice of thousands of lives were not enough to overcome the Turks, and after eight terrible months the allied forces withdrew from the peninsula. On the surrender of Turkey, in the fall of 1918, the allies demanded, as one of the armistice terms, permission to occupy the strait; in 1920 the allied powers proclaimed the strait internationalized (free to all nations). See World War; Constantinople.

DARIEN, *da ri en′,* Gulf of, a gulf of the Caribbean Sea, at the north extremity of South America, between the Isthmus of Panama and the mainland. The chief river flowing into it is the Atrato. Columbus reached the gulf on his fourth voyage in 1502. The Isthmus of Panama was formerly called Isthmus of Darien.

DARIEN SCHEME, a celebrated financial project set afloat by a Scotchman, William Patterson, whose purpose was to form a settlement on each side of the Isthmus of Darien (now Isthmus of Panama), in order to control the trade between the eastern and western hemispheres. Nearly $4,000,000 was subscribed, fully half of it in Scotland, and in 1698 1,200 Scotch colonists sailed for the isthmus. Disease and famine, however, caused them to desert their settlement and return to Scotland in June, 1699. Two other companies of about the same size also attempted to establish settlements at Darien, with equally unfortunate results.

DARIUS I (550–485 B. C.), a Persian king who attained the throne in 521 B. C. One of his first acts was to divide his empire into twenty satrapies, or provinces, with a governor over each. He reduced the revolted city of Babylon, and led an expedition of 700,000 men against the Scythians on the Danube. The Greeks had aided the Ionians in their struggle to free themselves from Persia, and Darius therefore sent an army under Mardonius to invade Greece. But the ships of Mardonius were destroyed by a storm in doubling Mount Athos, and his army was cut to pieces by the Thracians. Darius, however, fitted out a second expedition, which was met on the plains of Marathon by an Athenian army under Miltiades and completely defeated (490 B. C.). Darius had determined on a third expedition, when he died in 485. See MARATHON.

DARIUS III, the twelfth and last king of Persia. He ascended the throne in 336 B. C., when the kingdom had been weakened by luxury and the tyranny of his governors and could not resist the attacks of Alexander of Macedon; the army of Darius was totally routed on the banks of the Granicus, in Asia Minor. Darius then hastened to meet Alexander in the mountainous region of Cilicia and was a second time totally defeated near the Issus. Two years afterward, all proposals for peace having been rejected by Alexander, Darius collected another army, met the Macedonian forces between Arbela and Gaugamela, and was again routed. Alexander captured Susa, the capital, and Persepolis, and reduced all Persia. Meanwhile, Darius was collecting another army at Ecbatana in Media, when a traitorous conspiracy was formed against him, by which he lost his life, in 330 B. C.

DARK AGES, a term used to designate the period from about the fall of the Roman Empire, in 476, to the revival of learning, in the twelfth century. Sometimes the words are understood to mean the entire Middle Ages, but usually only the earlier part of that period is so designated. See MIDDLE AGES.

DAR'LING, GRACE HORSLEY (1815–1842), a celebrated English heroine. In 1838 the steamer *Forfarshire*, with forty-one passengers on board, besides her crew, became disabled off the Farne Islands during a storm and was thrown on a rock, where it broke in two, part of the crew and passengers being left clinging to the wreck. The next morning William Darling observed them from Longstone lighthouse, about a mile distant, but he shrank from attempting to reach the wreck in an open boat in such a raging sea. His daughter Grace, however, implored him to make the attempt and let her accompany him. At last he consented, and father and daughter reached the wreck and succeeded in rescuing nine sufferers. The news of the heroic deed soon spread, and the brave girl received testimonials from all quarters. A purse of $3,500 was publicly subscribed and presented to her. Four years later she died of consumption, honored throughout the world.

DARMSTADT, *dahrm'staht*, GERMANY, capital of the former grand duchy of Hesse, is situated fifteen miles south of Frankfort-on-the-Main. Among the remarkable buildings are the old grand-ducal palace, containing one of the largest libraries in Germany, the Catholic church, and the Rathaus, or townhall, built in 1580. Darmstadt is a busy manufacturing town. There are iron foundries, breweries, machine shops, tobacco factories, carpet works, and manufactories of scientific instruments, chemicals and playing cards. The town is also an important railway center. In 1330 it secured municipal rights, and in 1567 it became the capital of Hesse. It was burned by the French in the seventeenth century, but afterwards rapidly rose in importance. Population, 1919, 82,367.

DAR'NEL, the popular name of a species of poisonous grass. It appears to be the tares of Scripture. It is said to have narcotic and stupefying effects, but recent researches have cast some doubt on its reported injurious qualities. It is met with in corn fields, and is now naturalized in North America.

DARNING NEEDLE. See Dragon Fly.

DARNLEY, Henry Stuart, Lord (1545–1567), the second husband of Mary Queen of Scots. He was a son of the Earl of Lennox and Lady Margaret Douglas, a niece of Henry VIII. In 1565 he was married to Mary Queen of Scots. It was an unfortunate match; Mary was disgusted at his coarseness and could not long conceal her contempt. His part in the murder of Rizzio angered Mary still further, and when, on February 9, 1567, the house in which he lay recovering from an illness was blown up by gunpowder, Mary was suspected of complicity in the crime. See Mary Stuart.

DARTER, or **SNAKE BIRD,** the latter name applied because of the length of the neck, is a web-footed bird related to the cormorant and found near the eastern coasts of tropical America and the western coast of tropical Africa, as well as in Australia. It is the habit of these birds to perch on trees by the water side and, after hovering an instant over the water, suddenly to dart at their prey with unerring aim. Their nests are rudely constructed in trees, and the eggs are bluish in color.

DARTER

DARTMOUTH, *dahrt′muth,* Nova Scotia, in Halifax County, on Halifax Harbor opposite Halifax, and on the Intercolonial Railway. The industries include cordage works, a sugar refinery, a cornmeal mill, chocolate and molasses factories, ship repairing and boiler works. The town has six churches and several banks. There is a little gold mining and some agriculture in the vicinity. Population, 1921, 7899.

DARTMOUTH COLLEGE, one of the earliest and best known of American colleges, situated at Hanover, N. H. The college is the outgrowth of an Indian school which was opened in 1754 and was founded by Rev. Eleazar Wheelock. The institution was named from the Earl of Dartmouth, who was one of the principal contributors and the first president of the board of trustees. The college began its existence in the midst of the wilderness, and the only buildings for several years were log huts, but it continued to increase in numbers and influence until it became one of the leading colleges of the country. Later, a religious controversy caused the state legislature to create a new corporation, which, without consent of the old board of trustees, assumed control of the college. This led to what is known as the Dartmouth College Case (see below). The college still remains an institution for men only. It confers degrees in letters, science, arts, medicine and civil engineering. In the fall of 1917 there were 1,016 students and 139 faculty members; by 1922, there were 160 in the faculty, and over 2,000 students in the college. The library contains 265,000 volumes.

Dartmouth College Case. Dartmouth College was founded by a charter granted by George III in 1769. When the independence of the United States was established, the state of New Hampshire assumed the position occupied by the throne under the colonial government. In 1816 the legislature created a new corporation for the college, making certain changes in its management. The college appealed to the courts, but lost its suit, and then appealed to the United States Supreme Court where its case was argued by Daniel Webster. The Supreme Court, in a decision handed down by Chief Justice Marshall in 1819, declared that the legislature did not have authority to legislate the old charter out of existence, or to pass laws violating its provisions, by reason of the clause in the United States Constitution which establishes the inviolability of contracts.

DARWIN, Charles Robert (1809–1882), one of the world's greatest naturalists, the leading scientist of the nineteenth century, was born in Shrewsbury, England. He early devoted himself to the study of natural history, and in 1831 was appointed naturalist to the surveying voyage of H. M. S. *Beagle.* Darwin came home with rich stores of knowledge, part of which he soon gave to the public in various works. In 1859 his name attained its great celebrity by the publication of *The Origin of Species by Means of Natural Selection.* This work, scouted and derided though it was at first in certain quarters, may be said to have worked nothing less than a revolution in biological science. In it for the first time was given a full exposition of the theory of evolution as applied to plants and animals, the origin of species being explained on the hypothesis of natural selection. This theory is now generally accepted by the prominent scientists, though modified and improved in many of its details. The rest of his works are largely based on the material he had accumulated for the elaboration of this great theory. The principal ones are a treatise on the *Fertilization of Orchids; Domesticated Animals and Cultivated Plants; Descent of Man and Variation in Relation to Sex; The Expression of the Emotions in Man and Animals; Movements and Habits of Climbing Plants; Insectivorous Plants; Cross and Self Fertilization; The Power of Movement in Plants,* and *The Formation of Vegetable Mold.* See EVOLUTION.

CHARLES DARWIN

DAS'KAM, JOSEPHINE DODGE. See BACON, JOSEPHINE DASKAM.

DATE, the fruit of the date palm, or the tree itself. The fruit is used extensively as an article of food by the natives of Northern Africa and of some countries of Asia. It consists of a fleshy coat, separable into three portions, and covering a hard, horny seed. Next to the cocoanut palm, the date is unquestionably the most interesting and useful of the palms. Its stem shoots up to the height of fifty or sixty feet, without branch or division, and is of nearly the same thickness throughout its length. From the summit it throws out a magnificent crown of large, feather-shaped leaves, besides a number of stalks, each of which in the female plant bears a bunch of from 180 to 200 dates, each bunch weighing from twenty to twenty-five pounds. The fruit is eaten fresh or dried. Cakes of dates pounded and kneaded together are the food of the Arabs who traverse the deserts. A liquor resembling wine is made from dates by fermentation. Dates are now being cultivated in California, Arizona and other warm-weather states with considerable success; a large industry is developing.

DATE PALM

DAUDET, *do dä',* ALPHONSE (1840–1897), a French novelist, born at Nîmes He went to Paris in 1857 to seek his fortune but his collections of poems failed to win any attention, and his plays met with little better reception. When he discovered his powers as a story-teller, however, his success was assured. The volumes of short stories, *Letters from My Mill* and *Monday Tales,* established his reputation, which was rendered more secure by each novel which he published. *Numa Roumestan* and *The Nabob* are probably his greatest works, although many readers find *Tartarin of Tarascon* the most attractive. Daudet himself regarded *Sapho* as the best of his writings, and it has become widely known through dramatization.

DAUGHTERS OF THE AMERICAN REVOLUTION, a patriotic national society, organized in Washington, D. C., in 1890. Only those women whose ancestors fought upon the American side in the Revolutionary War are admitted to membership. Its purpose is the fostering of reverence for the achievements of the Revolutionary heroes and the collection of relics and the erection of monuments. There are chapters in almost all the states and in Canada, Hawaii and Alaska. Its membership of 105,000 is divided among 1,300 local chapters. The society owns a beautiful memorial hall in Washington, completed in 1910.

DAUGHTERS OF THE CONFEDERACY, UNITED. See CONFEDERACY, UNITED DAUGHTERS OF THE.

DAUPHIN, *daw'fin,* the title given to the eldest sons of the former kings of France. The name was assumed toward the middle of the ninth century by the lord of Dauphiny, which province was bequeathed by Humbert II to the King of France in 1349, on condition that the heir of the throne should bear the title of Dauphin of Vienne and should govern the province.

DAVENPORT, FANNY LILY GIPSY (1850–1898), an American actress, born in London, but educated in Boston. She was only seven years old when she first appeared on the stage and was but twelve when she made her formal début in *Faint Heart Never Won Fair Lady.* After playing for a short time in Mrs. Drew's theater in Philadelphia, she became connected with Augustin Daly's company in New York. Among her most famous portrayals were the leading rôles in *Fedora, Cleopatra* and *La Tosca.*

DAVENPORT, IOWA, the county seat of Scott County, on the Mississippi River, 330 miles above Saint Louis, 183 miles west of Chicago, and opposite Rock Island, Ill. It is on the Chicago, Rock Island & Pacific, the Chicago, Milwaukee & Saint Paul, the Chicago, Burlington & Quincy and other railroads of local importance.

The city is built upon the sides of a bluff and has a beautiful location overlooking a wide extent of country. It is connected with Rock Island by a railroad bridge and a combined wagon and railroad bridge. The important buildings include four hospitals, a Carnegie Library, a commercial club building, the fine Blackhawk Hotel and a number of fine office buildings. Among the educational institutions are the Academy of the Immaculate Conception, Saint Ambrose College, Saint Katherine's Hall and Palmer's Chiropractic College. The leading church edifices are the Protestant Episcopal and Roman Catholic cathedrals, Saint John's Methodist Church and the Kirkwood Presbyterian Church. The Iowa Soldiers' Orphans' Home is also located here. The city has a large trade in farm produce and is the seat of a number of extensive industries, including meat packing, manufactories of flour, lumber, wagons, carriages, farming implements and machinery, locomotives, pumps, steel cars and soap. Davenport was founded in 1833, and was named for Colonel George Davenport, leader of the company forming the first settlement. It was incorporated as a town in 1838 and as a city in 1851. Population, 1910, 43,028; in 1920, 56,727, a gain of 32 per cent.

DA'VID, king of Israel, the youngest son of Jesse, a citizen of Bethlehem, and descended through Boaz from the ancient princes of Judah (*I* and *II Sam.; I Chron.*). He reigned from 1055 B. C. to 1015 B. C., according to the usual chronology, but recent investigations put the dates from thirty to fifty years later. Under David the empire of the Israelites rose to the height of its power, and his reign has always been looked on by the Jews as the golden age of their nation's history. Much of David's history is told in detail in the subhead *Bible Stories,* under the heading BIBLE.

DAVIES, LOUIS HENRY, Sir (1845–), a Canadian statesman and jurist, born at Charlottetown, Prince Edward Island. He was educated at the Prince of Wales College in that city and in London, England. Davies began the practice of law in his native city in 1866 and became one of the leaders of his profession. In 1869 and 1871–72 he was solicitor-general of the province; 1873–76, leader of the opposition; 1876–79 premier and attorney-general. He was elected to the Dominion House of Commons as a Liberal in 1882 and continuously returned until 1901, when he was appointed judge of the Supreme Court of Canada. He was counsel for Great Britain before the International Fisheries Arbitration Commission at Halifax in 1877, joint delegate with Sir Wilfrid Laurier to Washington for the settlement of the Bering Sea controversy in 1897, and a member of the Joint High Commission for the settlement of all disputes between Canada and the United States. From 1896 to 1901 he was Minister of Marine and Fisheries.

DAVIS, David (1815–1886), one of America's greatest jurists of the Civil War period, was born in Cecil County, Md. He was graduated from Kenyon College, Ohio, studied law in Massachusetts and Connecticut, and removed to Illinois in 1835. In 1844 he was a member of the state legislature, and in 1848 was made United States circuit judge. In October, 1862, President Lincoln appointed him Associate Justice of the Supreme Court. Judge Davis was nominated by the labor reformers for President in 1872, but he usually affiliated with the Democratic party. In March, 1877, he resigned to enter the United States Senate, where he remained until 1883.

Beauvoir

DAVIS, Jefferson (1808–1889), an American statesman, president of the Confederate States of America, whose memory is cherished in the South with unceasing devotion. Like Lee, he typified in a very definite way the ideals which inspired those who fought for the Confederacy. Jefferson Davis was born on June 3, 1808, in Christian (later Todd) County, Kentucky. At an early age he went with his parents to Mississippi, where he received his preliminary education. He later entered West Point Military Academy, graduating in 1828, and for seven years he saw important service on the frontier. After engaging for several years in cotton planting, he was elected to Congress in 1845, where he became an ardent follower of Calhoun.

At the commencement of the Mexican War Davis left Congress and entered the contest as colonel of a regiment, and performed distinguished service. He entered the Senate in 1847, and became the leader of the Southern Party in the slavery and States' rights controversy, frequently coming into opposition with Stephen A. Douglas. Davis was Secretry of War during Pierce's administration, and while holding this position introduced several marked improvements in military tactics, coast defense, armament and transportation. Upon the secession of Mississippi, he retired from the Senate, delivering a notable farewell address, and in the same year was elected president of the Confederate States.

During the war he acted with good judgment, dignity and devotion to principle and was especially anxious to mitigate the suffering and sorrow caused by the war. He was taken prisoner soon after the fall of Richmond and was confined in Fortress Monroe for two years. Released on bail in 1867, through the efforts of Horace Greeley and other Northerners, he was given full liberty by the general amnesty of 1868. During his last years Davis resided in Memphis and Mississippi, dying in New Orleans. In 1881 he published *The Rise and Fall of the Confederate Government,* giving his view of the controversy. His remains were removed from New Orleans and interred at Richmond in 1893, where a monument has been erected in his honor.

JEFFERSON DAVIS

DAVIS, Rebecca Harding (1831–1910), an American novelist, the first writer to bring the labor question into American fiction. Mrs. Davis was born in Washington, Pa. She first became known for the gloomy power of a story, *Life in the Iron Mills,* published (1861) in the *Atlantic Monthly.* After her marriage to L. Clarke Davis, editor of the Philadelphia *Inquirer,* much of her brilliant talent went into journalistic work which has not been preserved. Among her novels are *Dallas Galbraith, Kent Hampden* and *A Law unto Herself.*

DAVIS, Richard Harding (1864–1916), a very popular American novelist, short-story writer and journalist, the son of Rebecca Harding Davis, was born at Philadelphia. He was educated at Lehigh and Johns Hopkins universities, and began literary work as a newspaper reporter in Philadelphia. After serving for a time on the staff of the New York *Evening Sun,* he became managing editor of *Harper's Weekly.* This position he held but a short time. *Gallegher and Other Stories,* published in 1891, first gained him wide attention. Among his later popular and successful books were *Van Bibber and Others, Soldiers of Fortune, Ransom's Folly,* and *Cuba in War Time.*

He gained fame as a war correspondent; his reports from the battle fronts of Europe (1914–1916) were classics.

DAVIS, SAMUEL, (1844–1863), Confederate Scout. He was born in Tennessee, and joined the Confederate army in 1861. In 1863, Gen. Bragg selected Davis to receive from confederates within the Union lines plans of their works. He secured the documents, but was captured by Union soldiers, tried, and sentenced to death. Gen. Dodge of the Union army offered Davis life and freedom if he would name the traitor in the Union camp. Davis refused, saying: "I will die first; I will not betray the confidence of my informant." Many years after his death, a monument was erected to his memory.

DAVIS STRAIT, a narrow sea which separates Greenland from Baffin Land, and unites Baffin Bay with the Atlantic Ocean. It is from 180 to 500 miles wide and was discovered in 1585 by John Davis, after whom it was named.

DA'VITT, MICHAEL (1846–1906), an Irish political leader. In 1870 he was sentenced to fifteen years' imprisonment for bringing arms into Ireland, but he was released in 1878. The next year he founded the Irish Land League. While in prison he was repeatedly elected to Parliament, but was disqualified. He was later elected twice without opposition, but resigned in 1899.

DA'VY, HUMPHRY, Sir (1778–1829), a distinguished English chemist. He was appointed professor of chemistry in the Royal Institution at the age of twenty-four. In 1803 he was chosen a member of the Royal Society. His discoveries with the galvanic battery, his decomposition of the earths and alkalies and the ascertaining of their metallic bases gave him a worldwide reputation. From his investigation of firedamp in mines, he was led to the invention of a safety lamp, which has rendered the mines comparatively free from explosions and thus prevented the death of thousands of workmen.

DAWSON, GEORGE MERCER (1849–1901), a Canadian geologist and explorer, born in Truro, N. S., educated at McGill University and the Royal School of Mines, London, Eng. He became a member of the staff of the Geological Survey in 1875, and was its director in 1895. He explored a large portion of the western country and made the mineral resources of the region known to the Canadian government. He was a member of the Bering Sea Commission of 1891.

DAWSON, JOHN WILLIAM, Sir, (1820–1899), a Canadian geologist and educator. He received his education at Edinburgh University and at an early age turned his attention to geology. In 1842 he accompanied Sir Charles Lyell on an expedition to examine the geology of Nova Scotia. In 1850 Dawson became superintendent of education for Nova Scotia, and five years later he was made principal and professor of geology in McGill University, Montreal, and later vice-chancellor. He was elected president of the American Association for the Advancement of Science in 1882, and four years later became president of the British Association for the Advancement of Science. Among his many contributions to the literature on science are *Acadian Geology; The Story of the Earth and Man; The Origin of the World; Egypt and Syria; Modern Ideas of Evolution,* and *The Change of Life in Geological Time.*

DAWSON, YUKON DISTRICT, named for Sir John William Dawson (which see), is a city in Canada, the capital of the district, on the right bank of the Yukon River, 330 miles northwest of Skagway, on the line of the Pacific & Arctic Railway & Navigation Company, and there is a twelve-mile line of railroad to Bonanza. The river is open to navigation from June 1 to October 15. There are several churches, schools, hotels and theaters, and the town is lighted by electricity. Dawson is the center of the Klondike gold mining region; its origin dates from the discovery of gold on Bonanza Creek in 1896, and it is now assured of a prosperous future, for the town has become stabilized. Coal deposits have been found in the neighboring region. There is brewing and garden truck farming, and the city has a quartz mill. Population, 1911, 4,000. In 1901, during the early "boom" days, there were over 9,000 people in Dawson.

DAY, the time occupied by the revolution of the earth on its axis, embracing the period of darkness as well as the interval of daylight. The day in the latter sense may be measured in more than one way. If we measure it by the apparent movement of the stars, caused by the rotation of the earth on its axis, we must call day the period between the time when a star is on the meridian and when it again returns to the meridian; this is a *sidereal* day. It is uniformly equal to 23 hours, 56 minutes, 4.098 seconds. But more important than this is the *solar* day, or the interval between two passages of the sun across the meridian of any place. The latter is about four minutes longer than the sidereal day, owing to the revolution of the earth round the sun, and it is not of uniform length, owing to the varying speed at which the earth moves in its orbit and to the obliquity of the ecliptic. For convenience, an average length of the solar day is taken, and this gives us the *mean solar* or *civil* day of twenty-four hours, the difference between which and the actual solar ray at any time is the *equation of time.*

The length of the days and nights at any place varies with the latitude and season of the year, owing to the inclination of the earth's axis. In the first place, the days and nights are equal all over the world on the 21st of March and the 21st of September, which dates are called the *vernal* (spring) and *autumnal equinoxes.* Again, the days and nights are always of equal length at the equator, which, for this reason, is sometimes called the *equinoctial* line. With these exceptions, we find the difference between the duration of the day and the night varying more and more as we recede from the equator.

The word *day* is also applied in popular speech to the period of time when the sun is above the horizon. In this sense it is used in distinction to night.

The Babylonians began the day at sunrising; the Jews at sunsetting; the Egyptians and Romans at midnight, as do most modern peoples. The civil day in most countries is divided into two portions of twelve hours each. The abbreviations P. M. (post meridiem), afternoon, and A. M. (ante meridiem), forenoon, indicate these divisions. The Italians in some places reckon the day from sunset to sunset and enumerate the hours up to twenty-four; the Chinese divide it into twelve parts of two hours each. For astronomical purposes the day is divided into twenty-four hours, instead of two parts of twelve hours. Formerly the English day began at noon, but since January 1, 1885, the day of twenty-four hours begins at midnight at Greenwich observatory; and this reckoning is now generally adopted for astronomical purposes throughout the world.

DAY, WILLIAM RUFUS (1849–), an American jurist and statesman, born at Ravenna, Ohio. He was graduated at the University of Michigan in 1870 and was admitted to the bar two years later. He practiced law at Canton, Ohio, until 1886 and was appointed to several important positions on the bench. Judge Day became first assistant Secretary of State in April, 1897, and was made Secretary of State upon the resignation of John Sherman in 1898. This position he resigned to act as chairman of the Spanish-American Peace Commission. He was appointed United States circuit judge by President McKinley in 1899 and was made Associate Justice of the Supreme Court in 1903 by President Roosevelt.

DAYLIGHT SAVING, a popular plan for conserving fuel, which not only accomplishes its intended purpose but gives workers in summer additional daylight hours for recreation. Under the law, as operative for years in Europe and in the United States for 1918, clocks and watches are set ahead one hour at midnight on the last Sunday in March and set back an hour on the last Sunday in October. Clock time is observed, the change is ignored, and not the slightest difficulty results. Rural opposition to a daylight saving law in the United States brought its repeal after one year's trial. Many cities have adopted daylight saving independently.

DAY LIL'Y, the popular name for a genus of lilies, natives of temperate Asia and Eastern Europe, two species of which are grown in gardens. They have long leaves, growing from the ground, and a branched stem with large, fragrant, white blosoms, the segments of which are united into a tube. The blossoms live only from sunrise to sunset.

DAY'TON, OHIO, one of America's most progressive cities, is the county seat of Montgomery County, on the Great Miami River, sixty miles northeast of Cincinnati, on the Cleveland, Cincinnati, Chicago & Saint Louis, the Erie, the Pennsylvania and the Dayton & Union railroads. The city has a beautiful location in the fertile Miami Valley. From the main business portion, the land rises to heights of from 100 to 400 feet, and on these elevations are some of the fine residence sections. Van Cleave Park, along the river, where the first settlers landed, contains the first house built in Dayton, which now serves as an historical museum. There is a fine soldiers' monument on Main Street near the river bridge. Spanning the rivers are twelve bridges, three of which are beautiful, wide, arched structures of concrete. On an elevation adjoining the city at the west is the central branch of the National Soldiers' Home, which occupies beautiful grounds of about 600 acres. The public library stands in Library Park, near the center of the city.

The educational institutions of Dayton include the United Brethren Theological Seminary, Saint Mary's Institute and the Academy of Notre Dame. The Miami Valley and Saint Elizabeth's hospitals, a state asylum for the insane, a county orphan asylum and a widows' home are other institutions. There are many fine churches, and some of the prominent buildings are the old and new courthouses, the Y. M. C. A. building, the Steele and the Stivers high schools, the public library and the state hospital.

There are many large industrial establishments, the city ranking third in industries in the state. Dayton is the home of the greatest cash register concern in the world. It also manufactures railway cars, oil-mill machinery, steam pumps, sewing machines, bicycles, automobiles, engines, flour, sash and blinds and various other articles. In 1796, the first settlement was made on land which was purchased the previous year from the Indians by Colonel Ludlow and Generals Saint Clair Wilkinson and Jonathan Dayton, after whom the place was named. It was incorporated in 1805, and was chartered as a city in 1841.

In March, 1913, the city suffered disastrously from a great overflow of the Miami. Several hundred lives were lost and millions of dollars worth of property were destroyed. For several days Dayton was entirely cut off from the rest of the world because tracks were washed out and wires were down. Many other towns of the Ohio Valley also suffered. In the same year Dayton adopted the commission form of government, which was followed in January, 1914, by the appointment of a city manager (which see). Population, 1910, 116,577; in 1920, 153,830.

DE, *day,* a French preposition meaning *of, from* or *away from,* used in connection with proper names to indicate noble origin or possession of territory, as *Duc de Montmorenci, Guy de Maupassant, Conte d'Artois.* When the word following the preposition begins with a vowel the *e* is dropped and *d* with an apostrophe is used, as in *d'Artois.* Several French expressions containing *de* or *d'* are heard frequently in English current speech, as *coup d'etat* and *table d'hote.*

DEACONESS, *de'kon ess,* a member of any one of various religious orders of women among Protestant churches. The order of deaconesses seems to have been established during the days of the Apostles, and the functions of the members were to assist the deacons and other officials of the church, especially in the care of women. In the fifth century the order was abolished and was not revived until the early part of the nineteenth century. The first of the modern orders was established in Prussia in 1836, by the United Evangelical Church.

The first order in the United States was established in Saint Andrew's Parish of the Protestant Episcopal Church, Baltimore, in 1855, and in 1888 the general conference of the Methodist Episcopal Church provided for the establishment of an order of deaconesses. The members of the modern orders are required to prepare themselves by special training in schools devoted to this purpose and are usually inducted into office by the authorities of the Church. Their work is similar to that of the early deaconesses, though somewhat more extended, as the requirements of the Church are broader. In the Roman Catholic and some of the Episcopal churches, the work corresponding to that of the deaconesses is preformed by sisterhoods.

DEAD-LETTER OFFICE, a division of the Post Office Department to which is sent all mail matter that cannot be delivered. This matter includes all letters and packages that have remained in the office to which they were sent for one month without being called for, and which do not contain any address for their return to the sender; letters, papers and packages that are imperfectly addressed, and articles excluded from the mails by the regulations of the postal authorities, such as liquids, live animals and explosives.

Each year from 12,000,000 to 15,000,000 letters and parcels reach the dead-letter office. About half are returned to the senders, and the remainder are destroyed. Practically a million letters contain money—as much some years as $7,500,000. Nearly all this money is returned to the senders; that which cannot be so disposed of—from $30,000 to $50,000—is put into a fund to help pay the expenses of the office.

DEAD RECK′ONING, the calculation of a ship's place at sea, without any observation of the heavenly bodies. It is obtained by keeping an account of the distance the ship has run by the log and of its course steered by the compass, and by rectifying these data by the usual allowance for drift, leeway and winds. Dead reckoning can never be accurate; so whenever possible it is corrected by astronomical observations.

DEAD SEA, called in Scripture SALT SEA, SEA OF THE PLAINS, and EAST SEA, a celebrated lake in Asiatic Turkey, near the south extremity of Palestine. Its length is about forty-seven miles, and its breadth at the widest part, nine miles. The basin in which the Dead Sea lies forms the south end of the great depression through which the Jordan flows, that river entering the lake at its north extremity. It receives several other tributaries, but has no outlet. The surface is 1,310 feet below the level of the Mediterranean. It lies deeply inbedded between lofty cliffs of naked limestone, its shores presenting a scene of indescribable desolation and solitude, encompassed by desert sands and bleak, stony, salt hills. Sulphur and rock salt, lava and pumice abound along its shores. The water is nauseous to the taste and smell, and it is so buoyant that the human body will not sink in it. The Dead Sea contains no life of any kind. At about a third of its length from the north end it attains a maximum depth of 1,308 feet.

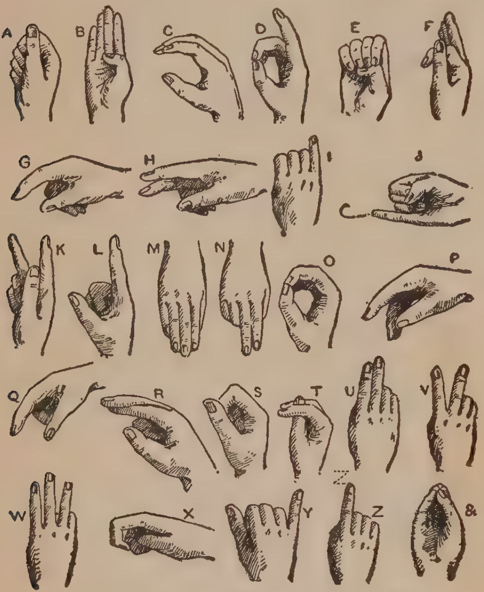
DEADWOOD, S. D., the county seat of Lawrence County, near the western boundary of the state, on the Chicago, Burlington & Quincy and the Chicago & North Western railroads and on an electric line. The city is in the center of a rich gold belt, and cyanide works, smelters and other mining industries are located here. It is also the seat of a United States assay office, where millions of dollars in gold are handled every year. Among the important buildings are a Masonic Temple, a Carnegie Library, the Stilwell Curio Museum and a Federal building. The place was settled in 1876. Population, 1920, 2,403.

DEAF, *def*, **AND DUMB** (or **DEAF-MUTES**), persons who cannot hear or speak. Some mutes are speechless because of defects of the vocal organs, but there are many whose inability to articulate sounds arises from their never having heard those sounds. Human beings learn to speak through imitation of others whom they hear. There are two forms of deafness, *congenital* (existing from birth), and *acquired.*

Among the causes assigned for congenital deafness are the intermarriage of near relatives, hereditary transmission, scrofula, certain local or climatic conditions and arrest of development before birth. Acquired or accidental deafness, which occurs at all ages, is frequently due to such diseases as smallpox, measles, typhus, paralysis and other affections of the brain, but more particularly to scarlet fever, which may leave the patient deaf because the inflamed state of the throat extends to the internal ear, and thus causes the formation of pus and the destruction of the extremely delicate parts of the auditory apparatus.

The necessity of communication and the want of words oblige the deaf-mute to observe and imitate the actions and expressions which accompany various states of mind and of feeling, to indicate objects by their appearance and use, and persons by some peculiar mark, and to describe their actions by direct imitation. In this way he and his friends are led to form a dialect of that universal language of attitude, gesture and expression which becomes a substitute for words in the hands of the pantomimic actor, and which adds force and clearness to the finest effusions of the orator; in other words, the natural sign language, which, in its elements, is to be found among all nations. Such a means of communication is at its best very imperfect, however, and various more perfect systems have been devised to enable deaf-mutes to communicate with one another and with the rest of mankind, and thus to gain such an education as people in general possess.

Education of the Deaf and Dumb. In ancient times and during most of the Middle Ages, the deaf were considered incapable of caring for themselves and could not enter upon a contract. In 1648 John Bulwer published a work in English advocating the education of deaf-mutes. About one hundred years later the first public demonstration of the practicability of such education was made. At about the same time a successful system of instruction was introduced into the Royal Parisian Institute, where it was followed for a long time. The vocal system of instruction was introduced into Germany in 1779, and the first public institute in England was established in 1792.

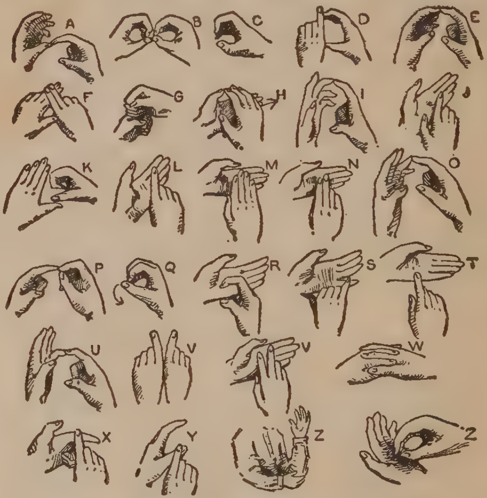


DEAF AND DUMB ALPHABET
For one hand

From this originated the London Asylum on Kent Road. The first school for the instruction of deaf in the United States was established at Hartford, Conn., in 1817. For a time this school received inmates from the New England states and from South Carolina and Georgia. Massachusetts then established an institute, and other states followed, until now every state has an institution for the education of deaf-mutes, and several states have provisions for establishing classes in connection with the public schools. In the entire country there are over 150 state, private and public day schools for the deaf; Canadian cities maintaining such institutions include Montreal, Quebec, Toronto, Winnipeg and Victoria.

There are two methods of instruction which are generally followed. These are known as the *sign* method and the *oral* method. According to the first, the pupils are taught by the manual alphabet and by signs. According to the oral method the pupils are taught to observe the lips and other vocal organs of the teacher and then to reproduce the sounds. In the teaching of deaf children to speak, the pupils not only are expected to observe the motions of the organs, but are required to place their hands upon the throat of the teacher and feel the vibrations, then to place their hands upon their own throats and reproduce these vibrations. In some schools the Bell system of visible speech (which see) has replaced the method just described. The Bell system consists of a series of alphabetical characters based on the position of the vocal organs when they are moving. In the most up-to-date schools pupils learn lip reading in connection with the study of vocal sounds. By observing the motion of the lips they learn to recognize words and can thus carry on conversations with comparative ease.

Opinion has been divided on the advantages to be derived from each of these methods of instruction. Those who favor the sign method claim that it is much more easily learned, and that the pupils therefore can make more rapid progress; while the opponents of this system claim that the use of the sign language is not calculated to develop the intellect, and that pupils trained by this method never receive as broad an education or become as efficient thinkers as those trained by the oral method. The general trend of opinion is decidedly in favor of the oral method, and in the greater number of American schools the sign method is not used. See KELLER, HELEN A.; SIGN LANGUAGE.



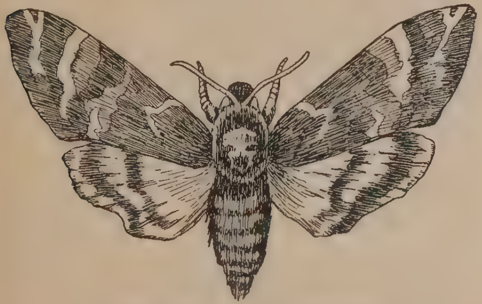
DEAF AND DUMB ALPHABET
For two hands

There is a growing body of literature on the subject of the education of the deaf, much of which is especially helpful to parents of afflicted children. Mention should be made particularly of John D. Wright's What the Mother of a Deaf Child Ought to Know, and recent volumes of the Volta Review, published by the Volta Bureau at Washington, D. C.

DEAR'BORN, HENRY (1751–1829), an American soldier who distinguished himself in many battles of the Revolution and in the War of 1812. He was captured by the British at Quebec, but was released and was with Washington at Yorktown. In 1793 he was elected to Congress, and for eight years he was Secretary of War. His last public service was as minister to Portugal. Fort Dearborn, on the site of Chicago, was named for him.

DEATH, the final condition of all animal and vegetable matter, characterized by the stoppage of all growth and motion. Human beings die when the heart stops beating, for this means arrest of the circulation and of the supply of nourishment to the tissues. Throughout life some of the body cells are always dying, and new ones are taking their places. The living body is therefore undergoing a continuous battle with death; we begin to die as soon as we begin to live. The subject of increasing the span of man's life by control of disease is one of the vital questions of the present day. In general, the death rate among civilized nations is gradually being lowered as knowledge of hygiene and sanitary science is increasing.

DEATH'S HEAD MOTH, a large moth, measuring five inches when the wings are extended. It has upon the back of its thorax marks closely resembling a skull, or death's head. Although the subject of many superstitious beliefs, it is probable that it does no other damage than occasionally attacking bees and consuming their honey.



DEATH'S HEAD MOTH

DEATH VALLEY, a desolate, arid plain bordered by mountains, situated near the eastern boundary of California, in Inyo County. During the rush to the gold fields in 1849, a band of emigrants lost most of their company in this barren region, and the name which they gave the valley has been retained. Death Valley is about 150 miles long and varies in width from ten to thirty miles. It is about 210 feet below sea level, and except for such characteristic desert growths as cacti and greasewood, it is without plant life.

Recently the United States Reclamation Service opened up several mineral springs in the valley, making it a safer place for miners and others who have to visit it. This region is one of the most important sources of borax (which see), and its mountain ranges contain also silver, copper, lead and gold quartz.

DEBATE, *de bayt'*, a formal discussion carried on by two opponents or two teams of opponents, in which each side endeavors to prove the truth of certain statements and to refute the arguments presented by the other side. The subject under discussion is generally stated in the form of a resolution, as, "Resolved, That city life is of greater benefit to the individual than country life." The side upholding this resolution is called the *affirmative;* the side presenting arguments against it is the *negative.* Sometimes the subject is framed as a question, as, "Should labor unions be encouraged?" In this case the affirmative side argues on the side of the labor unions, and the negative argues against them.

The first speaker for the affirmative always begins the debate; he is followed by the first speaker for the negative. The second speaker for the affirmative continues, and so on, alternately, until all have spoken once. Finally, the leader for the negative summarizes the arguments for his side, and the debate closes with a summary by the affirmative leader. Usually the decision as to the winner of the debate is left to three judges. They award the decision to the side which has presented the most points and has best answered the points made by the opposing side.

The ideal subject is one which permits a well-balanced argument. The points for and against should be as nearly equally divided as possible, or else one side will have an undue advantage. The resolution should be stated as clearly and as concretely as possible. Ambiguous phrasing leads to confusion of interpretation and prevents a really fair presentation. The subject should not be too general, and it should have enough points of interest to stimulate research and thought. A discussion as to the comparative merits of Grant and Lee is a good selection, because both generals were commanders in chief in the Civil War, and each was the best officer on his side. A debate on the merits of Napoleon and McClellan, on the other hand, is an example of a one-sided discussion. Again, if the subject of woman's rights be debated, the resolution should state clearly what rights are meant, whether voting, the right to hold office, equality in business life, or other right. Debating is an excellent drill for young people. It trains the mind to think logically, it develops ability to express oneself orally, and it trains the judgment. If worth while subjects are chosen it adds to the debater's store of information and gives him valuable training in research work.

Suggested Topics. Below is given a list of subjects appropriate for discussion by a school or neighborhood debating club:

Resolved,

That the censorship of moving pictures should be abolished.

That the United States should institute universal military service as a permanent feature.

That the settlement of labor disputes by arbitration should be made compulsory.

That all nations should be compelled to disarm after the World War.

That credits in Latin or Greek should not be required for college entrance.

That local option is more effective than state prohibition in dealing with intemperance.

That women should have equal voting rights with men.

That the honor system of examinations should be established in our high school.

That high school fraternities are undesirable.

That children under fourteen should not be permitted to work for wages.

That the Panama Canal should be made an international waterway.

That the Monroe Doctrine as a feature of the foreign policy of the United States should be abandoned.

That the law forbidding illiterate immigrants to enter the United States should be repealed.

That the Presidential term should be increased to six years and the President be ineligible to succeed himself.

That national governments should own and operate all telegraph, telephone and railroad systems.

Outline of a Debate. A subject appropriate for a school debate follows, with arguments for both sides outlined:

Resolved, that capital punishment should be abolished in the United States.

Affirmative

1. Capital punishment is unnecessary, for justice can be meted out to the offenders by means of imprisonment. Society is at the same time protected from their lawlessness.
2. Life imprisonment is a more severe punishment than death, because it makes the offender pay the penalty through a long period of time.
3. Capital punishment has evil effects upon the community, for—

A. It diminishes the sacredness in which human life is held; if the state claims the right to kill its citizens, individuals will feel that they are justified in taking life. Only God has the right to take human life.

B. Capital punishment tends to lower the moral sense of the public, for the details are usually published in all their horror.

C. It often leads to outbursts of sentimentality on the part of the public. Juries will sometimes acquit guilty prisoners rather than give decisions that mean death. Thus the murderer may be freed.

4. Capital punishment is not in accordance with the most enlightened methods of saving the criminal. It should be replaced by reformatory methods.
5. Capital punishment is a relic of a past age when cruelty and revenge were in vogue. This is a humane age, and the best thought of the time is opposed to the death penalty.

Negative

1. Capital punishment is the only sure punishment for grave crimes. An imprisoned murderer always has the hope of being pardoned. There is no sure protection from criminals so long as they are alive.
2. There is no greater punishment to the average person than taking away his right to life.

A. Capital punishment is merely a recognition of the right of the state to protect society from the evil passions of those who defy the law of God and man. A man who takes life is morally bound to pay for his crime with his own life.

B. The fact that newspapers publish nauseating details does not alter the justice of the execution. The papers should be prohibited from featuring such events as executions.

C. Trials for murder should be conducted without publicity. Sentimental outbursts are due to newspaper exploitation.

3. The first duty of the state in dealing with criminals is the protection of society. The fear of death acts as a deterrent on the passions of those who might commit murder, and where capital punishment is in force crimes are decreasing.

DEBORAH, *deb'o rah,* a prophetess of the Israelites, called a "mother in Israel," who lived during the time of the Judges. Her story is related in the book of *Judges,* the fifth chapter of which is a spirited poem called the *Song of Deborah.* It celebrates the victory which the Israelites, led by Deborah and Barak, won over the army of the Canaanites. Deborah was the wife of Lapidoth, and the family dwelt in the hill country of Ephriam, according to the account in *Judges* IV. There is no evidence that the *Song of Deborah* was written by her, though certainly she inspired it.

DEBS, Eugene Victor (1855–), an American Socialist of very radical theories. He was the Socialist party candidate for President of the United States in 1900, 1904, 1908, 1912 and 1920; in the latter year he was a Federal prisoner in Atlanta. Debs was born at Terre Haute, Ind. He received a common school education, became locomotive fireman on the Terre Haute & Indianapolis Railroad, and finally was a clerk in a wholesale grocery house. In 1879 he was elected city clerk of Terre Haute and six years later became a member of the Indiana legislature. From 1880 to 1893 he was grand secretary and treasurer of the Brotherhood of Locomotive Firemen, and in the latter year he was made president of the newly organized American Railway Union. In that capacity he had charge of the great western railway strike that centered at Chicago in 1894. During its progress he was charged with conspiracy, but was acquitted; however, he was imprisoned for six months for contempt of court in violating an injunction. From that time on he was an active Socialist leader.

EUGENE V. DEBS

Debs, with many other American Socialists, opposed America's participation in the World War, and in a speech made at Canton, Ohio, in June, 1918, he uttered statements forbidden by the espionage law. For making these statements he was tried, found guilty and sentenced to ten years' imprisonment. In March, 1919, the United States Supreme Court upheld the sentence of the lower court. His radical views did not undergo a change thereafter, for before he was taken to prison he reaffirmed his bolshevist principles and declared Lenine and Trotzky of Russia to be the greatest living men. From his prison cell in Atlanta he conducted his campaign to a slight extent, but his influence was confined to the radical element, who made a strong plea for the release and pardon of the candidate. In December, 1921, he received a commutation of sentence from President Harding, and was released.

DEBT, *det,* in the most general sense, that which is due from one person to another, but more strictly, in law, a sum of money due by reason of a particular and explicit agreement.

People are usually urged to avoid contracting debts under the conviction that indebtedness is a mortgage upon a person's future and therefore exceedingly dangerous. To contract debts for unnecessary purchases is properly frowned upon by economists, but there is a class of debts which are declared to be wholesome. To borrow money for business or home development, where the investment is permanent and there are very reasonable prospects of payment, has long been sanctioned. A proper debt serves as an incentive to honest endeavor.

An action to recover the amount of a debt is begun by civil suit, which may result in a judgment payable in money, or, in lieu of voluntary payment, by forcible seizure of enough of the debtor's property to pay the debt and the costs of the suit. Courts, however, still possess the right to punish severely and even to imprison debtors, where fraud or concealment of deception is evident.

Related Articles. Consult the following titles for additional information.

Bankruptcy
Contract
Embezzlement
Garnishment

DEBT, National. See National Debt.

DEBUSSY, *de bu se',* Claude Achille (1862–), a French composer, leader of the modern school of music in France. He is the exponent of the highest refinement in composition, and has had wide influence not only in France but in Spain, England and America. Debussy was educated at the Paris Conservatory, where he won several prizes, including the Grand Prix de Rome. After producing a number of miscellaneous works for piano and orchestra, he created a sensation in 1902 with a music drama, *Pelleas and Melisande,* a work that gave him an undisputed place at the head of the new French school. Since then he has made numerous other contributions to the world's body of written music, notably the ballets *Jeux* and *Crimen Amoris,* four music dramas and several songs.

DECALOGUE, *dek′a log,* the Ten Commandments, which, according to *Exodus* XX and *Deuteronomy* V, were given by God to Moses on two tables of stone. The Jews called them the *ten words,* and the term *decalogue* is made up of the Greek words for *ten* and *word.* Christians have divided the Ten Commandments differently; and in some Roman Catholic catechisms the second Commandment has been united with the first, and the tenth has been divided into two.

DECATUR, Ill., the county seat of Macon County, thirty-eight miles east of Springfield, on the Sangamon River and on the Illinois Central, the Wabash, the Vandalia and the Cincinnati, Hamilton & Dayton railroads. The city is in a fertile agricultural section, and ships large quantities of grain, live stock and coal. There are large grain elevators, flour mills, railroad shops and manufactories of iron, agricultural implements, soda fountains and cereals. The place was settled in 1830 and was incorporated six years later. The commission form of government was adopted in 1911. Population, 1910, 31,140; in 1920, 43,818, a gain of 41 per cent.

DECATUR, Stephen (1779–1820), one of the early heroes of the American navy, was born in Sinnepuxent, Md. In 1798 he entered the navy, and in 1803 he was given command of the *Enterprise.* The recapture and destruction of the United States frigate *Philadelphia,* which had been taken by the Tripolitans, was a daring act which won him promotion to the rank of captain. In 1812, while commander of the frigate *United States,* he encountered the British frigate *Macedonian* and captured her. On his way to sea through Long Island Sound, in 1813, Decatur's vessel was blockaded by the British fleet, and he was driven into New London where he was kept for a year by a blockade. In 1815 he was sent with a squadron of nine vessels to the Mediterranean, captured two Algerine vessels and compelled the dey of Algiers to negotiate a treaty. He then entered Tunis and Tripoli, forced the release of the American prisoners and obtained satisfaction for past offenses. His death was caused by a wound received in a duel with Commodore Barron.

STEPHEN DECATUR

DECCAN, *dek an′,* a term locally applied to the entire peninsula of India, but which more precisely refers to the presidency of Madras and part of Bombay, Hyderabad, Mysore, Travancore and other native states in the south. See India.

DECEMBER, *de sem′ber,* the twelfth month of the year. The name comes from the Latin *decem,* meaning *ten,* because in the Roman year, instituted by Romulus, it constituted the tenth month, the year beginning with March. In December the sun enters the tropic of Capricorn and passes the winter solstice. This month has thirty-one days. The birthstone for December is the turquoise, and its special flower is the holly.

Special Days for Observance. *Christmas* is the most important festival of the month of December. See Christmas.

New Year's Eve, the last day of the month, is a time of special festivities.

Forefathers' Day, December 21, is celebrated in some parts of New England in remembrance of the landing of the Pilgrim Fathers.

Anniversaries for Celebration. The following birthdays of notable persons fall in December:

Thomas Carlyle, December 4, 1795.
Martin Van Buren, December 5, 1782.
George A. Custer, December 5, 1839.
Mary Queen of Scots, December 7, 1542.
Eli Whitney, December 8, 1765.
Joel Chandler Harris, December 8, 1848.
John Milton, December 9, 1608.
William Lloyd Garrison, December 10, 1805.
Edward Eggleston, December 10, 1837.
Phillips Brooks, December 13, 1835.
Jane Austen, December 16, 1775.
Sir Humphry Davy, December 17, 1778.
John Greenleaf Whittier, December 17, 1807.
Lyman Abbott, December 18, 1835.
Edward A. MacDowell, December 18, 1861.
Cyrus Townsend Brady, December 20, 1861.
Clara Barton, December 25, 1821.
Sir Isaac Newton, December 25, 1642.
Woodrow Wilson, December 28, 1856.
William E. Gladstone, December 29, 1809.

The following important events occurred in December:

Reading in Congress of President's message containing the Monroe Doctrine, December 2, 1823.

Illinois admitted to the Union, December 3, 1818.
Rome made capital of United Italy, December 5, 1870.
Columbus discovered Hayti, December 6, 1492.
Death of Jefferson Davis, December 6, 1888.
Bucharest, capital of Rumania, captured by Germans, December 6, 1916.
Formation of the Australian Confederation, December 9, 1885.
Mississippi admitted to the Union, December 10, 1817.
Indiana admitted to the Union, December 11, 1816.
Delhi made capital of India, December 12, 1911.
Alabama admitted to the Union, December 14, 1819.
President Wilson arrived in Paris, December 14, 1918.
Boston "Tea Party," December 16, 1773.
Landing of the Pilgrims, December 21, 1620.
Organization of the Methodist Episcopal Church in America, December 24, 1784.
Washington crossed the Delaware, December 25, 1776.
Iowa admitted to the Union, December 28, 1846.
Texas admitted to the Union, December 29, 1845.
First American Y. M. C. A. established in Boston, December 29, 1851.

DECEMVIRS, *de sem'virz,* (Latin, *decem,* ten, and *vir,* man), a board of ten men; specifically, the body of ten magistrates who had absolute authority in ancient Rome, 451–449 B. C. Those who officiated during the first of these years drew up an excellent code of laws and ruled wisely, but those who followed them were tyrannical and were driven from power.

DECIDUOUS, *de sid'u us,* **TREES.** The word *deciduous* is from the Latin, and means *to fall down.* A deciduous tree is one whose leaves fall off at a fairly regular time every autumn and are as regularly renewed in the spring. Nearly all forest trees are of this variety. While in most countries the loss of leaves is in the autumn, in some parts of the world the change from foliage to bareness is governed by arrival of the dry season. Those trees which are not deciduous are evergreen (which see).

DECIMAL FRACTIONS, *des'i mal frak'-shunz.* See ARITHMETIC.

DECLARA'TION, in law, the first pleading in an action, submitted in writing and accompanied by affidavit. All the facts alleged must be set forth, for they constitute the plaintiff's whole cause for action. If such is not the case, the defendant by demurrer may have the case dismissed.

House in which the Declaration was written

DECLARATION OF INDEPEND'ENCE, the solemn declaration of the Continental Congress in America, in session at Philadelphia, by which the thirteen colonies formally renounced allegiance to the government of Great Britain. It was the outgrowth of a gradual change of sentiment among the colonists, away from the old affection for England and its traditions toward a pride in local achievements and the love of the principles of self-government. The formal declaration was preceded by resolutions in the assemblies of almost all of the colonies, declaring that independence was inevitable and necessary. Finally, on May 15, 1776, John Adams offered a resolution recommending that each state form its own independent government, and on June 7 another formal resolution was introduced by Richard Henry Lee, declaring—

> That these United Colonies are and of right ought to be, free and independent States; that they are absolved from all allegiance to the British Crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved;
>
> That it is expedient forthwith to take the most effectual measures for forming foreign alliances;
>
> That a plan of confederation be prepared and transmitted to the respective colonies for their consideration and approbation.

After a long and somewhat bitter debate, in which the representatives of New York and Pennsylvania opposed the resolution, causing a delay of some weeks, it was passed on July 1, New York alone still withholding its approval. A committee to draft a declaration had been appointed on June 10, consisting of Thomas Jefferson of Virginia, John Adams of Massachusetts, Benjamin Franklin of Pennsylvania, Roger Sherman of Connecticut and Robert R. Livingston of New York. As it was presented the Declaration was the work chiefly of Thomas Jefferson, and was adopted with few changes, on July 4, by twelve colonies, New York adding its approval on July 9. The document was endorsed and signed on August 2, 1776. The news of the adoption on July 4 caused the wildest rejoicing in all parts of the country and did much to produce unity of sentiment throughout the colonies. The original document is now in the State Department, and is sealed in a steel case for preservation among the priceless relics of the nation.

The Text. The Declaration of Independence, as adopted, is in full as follows:

THE UNANIMOUS DECLARATION OF THE THIRTEEN UNITED STATES OF AMERICA

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the Powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident: that all men are created equal, that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness. That to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute a new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and accordingly all experience hath shown that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security.—Such has been the patient sufferance of these colonies; and such is now the necessity which constrains them to alter their former systems of government. The history of the present king of Great Britain is a history of repeated injures and usurpations, all having in direct object the establishment of an absolute tyranny over these States. To prove this, let facts be submitted to a candid world.

He has refused his assent to laws the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operation till his assent should be obtained; and when so suspended, he has utterly neglected to attend to them.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the legislature, a right inestimable to them and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly, for opposing, with manly firmness, his invasions on the rights of the people.

He has refused, for a long time after such dissolutions, to cause others to be elected; whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the State remaining, in the meantime, exposed to all the dangers of invasion from without, and convulsions within.

He has endeavored to prevent the population of these States; for that purpose obstructing the laws for naturalization of foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new appropriations of lands.

He has obstructed the administration of justice, by refusing his assent to laws for establishing judiciary powers.

He has made judges dependent on his will alone for the tenure of their offices, and the amount and payment of their salaries.

He has elected a multitude of new offices, and sent hither swarms of officers to harass our people and eat out their substance.

He has kept among us, in times of peace, standing armies without the consent of our legislatures.

He has affected to render the military independent of and superior to the civil power.

He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his assent to their acts of pretended legislation:

For quartering large bodies of armed troops among us:

For protecting them, by a mock trial, from punishment for any murders which they should commit on the inhabitants of these States:

For cutting off our trade with all parts of the world:

For imposing taxes without our consent:

For depriving us, in many cases, of the benefits of trial by jury:

For transporting us beyond seas to be tried for pretended offenses:

For abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries, so as to render at once an example and fit instrument for introducing the same absolute rule into these colonies:

For taking away our charters, abolishing our most valuable laws, and altering fundamentally the forms of our government:

For suspending our own legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated government here, by declaring us out of his protection, and waging war against us.

He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.

He is, at this time, transporting large armies of foreign mercenaries to complete the works of death, desolation and tyranny, already begun, with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation.

He has constrained our fellow-citizens, taken captive on the high seas, to bear arms against their country, to become the executioners of their friends and brethren, or to fall themselves by their hands.

He has excited domestic insurrections amongst us, and has endeavored to bring on the inhabitants of our frontiers, the merciless Indian savages, whose known rule of warfare is an undistinguished destruction of all ages, sexes, and conditions.

In every stage of these oppressions we have petitioned for redress in the most humble terms: our repeated petitions have been answered only by repeated injuries. A prince, whose character is thus marked by every act which may define a tyrant, is unfit to be the ruler of a free people.

Nor have we been wanting in attention to our British brethren. We have warned them, from time to time, of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, aquiesce in the necessity which denounces our separation, and holds them, as we hold the rest of mankind, enemies in war, in peace friends.

We, therefore, the Representatives of the United States of America, in general Congress assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the name, and by authority of the good people of these colonies, solemnly publish and declare, That these United Colonies are, and of right ought to be, free and independent States; that they are absolved from all allegiance to the British crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved; and that, as free and independent States, they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which independent States may of right do. And for the support of this declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other our lives, our fortunes, and our sacred honor.

(Signed) John Hancock.

New Hampshire—Josiah Bartlett, Wm. Whipple, Mathew Thornton.

Massachusetts Bay—Saml. Adams, John Adams, Robt. Treat Paine, Elbridge Gerry.

Rhode Island—Step. Hopkins, William Ellery.

Connecticut—Roger Sherman, Sam'el Huntington, Wm. Williams, Oliver Wolcott.

New York—Wm. Floyd, Phil. Livingston, Frans. Lewis, Lewis Morris.

New Jersey—Richd. Stockton, Jno. Witherspoon, Fras. Hopkinson, John Hart, Abra. Clark.

Pennsylvania — Robt. Morris, Benjamin Rush, Benja. Franklin, John Morton, Geo. Clymer, Jas. Smith, Geo. Taylor, James Wilson, Geo. Ross.

Delaware—Cæsar Rodney, Geo. Read, Tho. M'Kean.

Maryland—Samuel Chase, Wm. Paca, Thos. Stone, Charles Carroll of Carrollton.

Virginia—George Wythe, Richard Henry Lee, Th. Jefferson, Benja. Harrison, Thos. Nelson, Jr., Francis Lightfoot Lee, Carter Braxton.

North Carolina — Wm. Hooper, Joseph Hewes, John Penn.

South Carolina—Edward Rutledge, Thos. Heyward, Junr., Thomas Lynch, Junr., Arthur Middleton.

Georgia—Button Gwinnett, Lyman Hall, Geo. Walton.

DECLARATION OF WAR. See WAR, DECLARATION OF.

DECLINA'TION, in astronomy, the distance of a heavenly body from the celestial equator, measured on a great circle passing through the pole and also through the body. It is said to be north or south according as the body is north or south of the equator. Great circles passing through the poles and cutting the equator at right angles are called *circles of declination.* Twenty-four circles of declination, dividing the equator into twenty-four arcs of 15° each, are called *hour circles.* Declination, then, corresponds to latitude on the earth and is one of the two elements in determining the location of heavenly bodies. In other words, if the right ascension and the declination of a star are known, astronomers can locate it at once (see ASCENSION, RIGHT). Declination of the magnetic needle in the compass, or *magnetic declination,* is the variation of the magnetic needle from the true meridian of a place.

DECOMPOSITION, *de kom po zish'un,* is the breaking up of a compound into more simple parts. These parts may be either compounds or elements. In most cases decomposition separates one body into two or more bodies, but what is called double decomposition is a change or breaking up of two or more compounds into the same number of other compounds. Decomposition may be caused by such forces as heat, light, electricity and chemical reagents; or it may be due, as in the case of vegetable and animal matter, to very small animals or plants, called bacteria and ferments.

DECORATION DAY, a popular term applied to Memorial Day (which see).

DECOY, *de koi'*. In the United States and Canada a decoy is an artificial bird, made of wood and painted faithfully to represent a living bird. It is placed on the water, where it floats about in a lifelike manner, and thus attracts live birds of the same kind to the spot, where they may be shot by concealed hunters. Duck decoys are the most common. In every-day speech, anything which is a lure or a snare is called a decoy.

DEDUCTION, *de duk'shun*, in logic, is the process of reasoning from a general statement to a particular fact, from an abstract theory to a concrete case, from the universal to the individual. An excellent example of the deductive method is afforded by the reasoning followed by Leverrier in his discovery of the planet Neptune. In the latter part of the seventeenth century Sir Isaac Newton worked out the theory of universal gravitation; namely, that every particle of matter in the universe exerts an attractive force on every other particle.

Working from this theory (to cite an example), the French astronomer Leverrier figured that there must be an undiscovered planet in the heavens which was causing irregularities in the motions of the known planets. That is, he used the general theory that gravitation is everywhere in operation, and he worked to the concrete fact that there was a planet in a particular region in the heavens, because only the attractive force of such a planet could account for certain disturbances in the motions of the planets. Shortly after he published his deductions Neptune was discovered in the place indicated by him.

The opposite method of reasoning, called *induction*, is explained under that heading.

DEDUC'TIVE METHOD, in pedagogics, the method of teaching which begins with general truths, such as definitions and rules, and proceeds to apply them to particular facts. It is also called the *synthetic method*, because it creates individual ideas under general laws. It is the reverse of the inductive method and is adapted to much of the work in grammar grades and predominates in teaching in high schools, colleges and universities. Geometry affords an excellent illustration of a branch which is taught by the deductive method. The theorems are the general truths with which the pupil starts, and he proceeds to prove these by the demonstration of particular propositions. See INDUCTION; METHODS OF TEACHING.

DEE, the name of two rivers in Scotland. The larger rises in the neighborhood of Ben Macdhui, and after a course of twelve miles it is joined by the Geauley, runs through Aberdeenshire and a part of Kincardineshire and empties into the North Sea. It is ninety miles long. The smaller Dee rises near the northern boundary of Kirkcudbrightshire. It flows in a southeasterly direction during the first part of its course, and then westerly, falling into the Solway Firth. It is fifty miles long and is noted for its excellent fisheries.

DEED, a written agreement, sealed and delivered, whereby a transfer of title is effected. In popular use the word is applied only to transfers of land, but in law it is applied to many other transactions. In fact whether or not a certain document is a deed or not depends on its form, not on the property involved. Transfers of personal property, title to office, and contracts of almost any kind may be in the form of deeds.

A deed, under the common law, was not valid unless it was sealed and actually delivered to the person named to receive title, who is legally known as the "party to be benefited." Most of the states still require a seal, though in a few it has been abolished; in most of them, moreover, the word *Seal* written within a ring or a scroll, may be substituted for the actual wax seal. The important point is not that the seal must be there, but that it must be there as the act of the person or persons to be bound by it. It must be his "own act and seal."

A deed being a form of contract, it must be executed by persons legally capable of binding themselves, should name a consideration, and should fulfil the other requirements of a contract (see CONTRACT). Frequently the parties to a deed prefer not to let other people know how much money was involved. In such a case, the deed may mention a "nominal consideration," as one dollar. The deed is exactly as binding as if it stated the exact number of dollars for which the property was actually sold. A deed must always be on paper or parchment; it may be written, typewritten or printed. It must contain the names of the grantor and the grantee, and it should, for safety, be signed by both parties in the presence of witnesses, even if the laws of the particular state do not require signatures, as shown in the following form of warranty deed:

> THE GRANTOR, Arthur Jones, of the city of Topeka, in the county of Shawnee and state of Kansas, for and in consideration of the sum of seven thousand five hundred dollars, in hand paid, give, grant, sell and convey to Frank Rawson Walsh, also of the city of Topeka, county of Shawnee and state of Kansas, the following described Real Estate, to-wit: . . . . situated in the city of Topeka, in the county of Shawnee, in the state of Kansas.
>
> And I, the said Arthur Jones, the grantor, for my heirs, executors and administrators, do covenant with the said Frank Rawson Walsh, the grantee, his heirs and assigns, that I am lawfully seized in fee of the afore-granted premises; that they are free from all incumberances; that I have good right to sell and convey the same to the said Frank Rawson Walsh as aforesaid: and that I will, and my heirs, executors and administrators shall, warrant and defend the same to the said Frank Rawson Walsh, his heirs and assigns forever, against the lawful claims and demands of all persons.
>
> Dated, this nineteenth day of October, A. D. 1913.
>
> Witnessed by:
> Malcolm Cameron (Seal)
> Arthur Jones (Seal)
> Maurice Lawrence (Seal)
> Frank Rawson Walsh (Seal)

In the case of individuals, a deed signed by a married man should also be signed by his wife; in the case of corporations the charters or by-laws usually name the officers who may execute deeds and other contracts.

Warranty and Quit Claim. In some deeds, as in the form above, there is a clause known as the *warranty*. A *quit-claim* deed is one in which the grantor makes no guarantee, but simply conveys whatever title he has. A short form of quit-claim deed is given below:

> KNOW ALL MEN BY THESE PRESENTS, that I, Alfred Mason, of the city of Omaha, in the County of Douglas, and State of Nebraska, in consideration of six thousand dollars, in hand paid, do hereby grant, sell, remise, release and forever quit claim unto Chauncey Wilson, of the city of Omaha, in the County of Douglas and State of Nebraska, the following described real estate, situate in the County of Douglas and State of Nebraska: (describe properly the land or premises granted).
>
> TO HAVE AND TO HOLD the above described premises, with the appurtenances, unto the said Chauncey Wilson and to his heirs and assigns forever.
>
> Signed this tenth day of January, A. D. 1914.
>
> In the presence of Alfred Mason (Seal)
> Francis K. Polk Chauncey Wilson (Seal)

Where the grantor's title is perfect, a quit-claim deed is as effectual a transfer as a warranty deed, except that the grantee must—the courts say, "at his peril"—ascertain whether there are any claims against his title. In other words, by a warranty deed the seller assumes the responsibility for the title; by a quit-claim deed the responsibility rests on the buyer.

Registration. A deed, whether or not the statute requires it should be registered in the county recorder's office. The system of registration has greatly simplified the laws on the subject of deeds, and has made useless much of the early court decision on the subject. Nearly all the states and provinces of Canada have special legislation on the subject of deeds. Grantor and grantee should always be careful that they are following the law of the state or province in which the deed is executed.

Finality of Deeds. From early times deeds have been used for the transfer of land, but their practically exclusive use for this purpose is modern. A deed is, in fact, almost the sole remaining mode of conveying ownership or other interests in land. It is common knowledge that a deed is the most solemn and binding contract respecting property into which a man may enter. This overwhelming finality which has always attached to a deed is probably the result of a fact that deeds were first used in an age when writing was a great accomplishment, common only among the monks and priests. Its solemn character must have become established before the art of writing became more general.

DEER, a general name for certain hoofed animals constituting a family in which there are more than fifty species. Some of them are among the most beautiful specimens of animal life.

The distinguishing characteristic of the genus is that the members have solid, branching horns, which they shed every year. These antlers are outgrowths from the bone and are first covered by flesh and a velvety skin, which, when the horns are fully developed, dries up and is rubbed away, leaving the bones bare. The forms of the horns are various; sometimes they spread into broad palms, which send out sharp snags around their outer edges; sometimes they divide fantastically into branches, some of which project over the forehead, while others are reared upward in the air; or they may be so inclined backward that the animal seems almost forced to carry its head in a stiff, erect posture. After the breeding season the antlers fall off, leaving only a little prominence on the head, from which the new antlers develop with great rapidity. The male deer is called a *buck;* the female, a *doe;* the young, a *fawn.*

There are many species of deer, as the *red deer* or *stag,* the *fallow deer,* the *roebuck,* the *reindeer,* the *moose,* the *elk,* and the *wapiti.* (See article GAME, for illustrations.) Deer are fairly widely distributed over the world, though there are none in Australia and few in Africa, where the antelopes take their place. Hunting the deer is great sport in Northern woods, and the flesh, or *venison,* as it is called, is much desired for the table. However, as deer become scarcer year by year, laws have been passed to protect them, and the hunting season in many states and provinces is restricted to two or four weeks each year. The skin is valuable for making a leather, called *buckskin,* and the antlers and hoofs are used in the manufacture of various kinds of ornamental goods.

Related Articles. Consult the following titles for additional information:

Caribou
Elk
Moose
Reindeer

DE FACTO, *de fak′toh,* a Latin term meaning *actually existing.* A *de facto* government is one which exists and performs the functions of government, regardless of its legal right to existence or whether it represents the majority of the people. Such a government was that of Lenine and Trotzky in Russia after the counter-revolution of 1917. See DE JURE.

DEFOE′, DANIEL (1661–1731), one of the first English novelists, born in London. He was educated for the ministry, but began early to give his attention to literature. His first publications were political satires, notable among them *The True-born Englishman,* a pamphlet in favor of William III, and *The Shortest Way with Dissenters. The Apparition of Mrs. Veal,* published in 1706, showed much of the genius for making fiction seem like fact which so strongly marks Defoe's later work.

DANIEL DEFOE

In 1719 appeared *Robinson Crusoe,* reckoned usually as the first English novel, in the modern sense of the term. This was followed by *The Memoirs of a Cavalier, Captain Singleton, Moll Flanders, Journal of the Plague Year* and *Roxana,* which, while they never attained the popularity of his first work, nevertheless possessed many of the qualities which made that remarkable. Defoe's genius consisted in his ability to put himself in the place of his characters and to give without wearisomeness the details which make a story seem real.

DEGENERATION, *de jen er a′shun,* a term applied in biology to certain changes undergone by plant and animal life, whereby there is a falling off in size, productivity, vigor or other qualities. The causes of degeneration include lack of nourishment, disuse, and change of habit. The effect of long-continued disuse of a part or organ is shown in the uselessness of the small toe on the foot of man. Primitive man had flexible toes like those of the monkey, but as civilization caused changes of habit the toes, particularly the small one, degenerated, and the latter seems to be heading toward extinction. The vermiform appendix is an example of an organ which has lost whatever function it may originally have had. Not only do organisms degenerate, but whole classes, and this is true of the human race and of the lower animals.

The aborigines of Australia are a degenerate race; in the animal world one might cite parasites, sponges and barnacles as examples of degeneration. In the vegetable world we find that plants which are forced to grow for a succession of years in poor soil or an unfavorable climate tend to become inferior. Mental and moral degeneration among civilized peoples is one of the vital questions with which eugenics, sociology and religion have to deal.

DEGLUTITION, *deg lu tish′ụn.* See SWALLOWING.

DEGREE, a term denoting extent or intensity. In mathematics it is the ninetieth part of a right angle, or one of the 360 equal parts into which the circumference of a circle is supposed to be divided. A *degree of latitude* is the 360th part of the earth's circumference north or south of the equator, measured on a great circle at right angles to the equator, and a *degree of longitude* is the same part of the surface east or west of any given meridian, measured on a circle parallel to the equator.

Degrees are marked by a small ° near the top of the last figure of the number which expresses them; thus, 45° is 45 degrees. The degree is subdivided into sixty equal parts, called minutes; and the minute is again subdivided into sixty equal parts, called seconds; thus, 45° 12′ 20″ means 45 degrees, 12 minutes and 20 seconds. Under the equator a degree of longitude contains 60 geographical or 69.16 statute miles (see Mile). The degrees of latitude are found to increase in length from the equator to the poles, owning to the shape of the earth. At the equator, 1° of latitude equals about 68.7 miles; at 45°, 1° equals about 69.05 miles.

The term *degree* is also applied to the divisions, spaces or intervals marked on a mathematical, meteorological or other instrument, as a thermometer or barometer.

In Education. The name *degree* is also given to the title bestowed upon one who has successfully completed a prescribed course of study or training. There is no strict uniformity in requirements for a degree in America, so the value of a degree varies. In some schools a knowledge of Greek is required for the degree *bachelor of arts;* in others no such requirement exists. A course of study including languages and philosophy as major divisions leads to the degree named above; if sciences and mathematices or engineering are prominent, the degree given is that of *bachelor of science.* A course in law confers the degree *bachelor of law.* Postgraduate courses lead to the *master's* and *doctor's* degrees.

DE GROOT, *de grote′,* Hugo. See Grotius, Hugo.

DE JURE, *de joo′re.* The term is from the Latin and means *by right,* or *by lawful title.* A *de jure* government is one which exists by legal right, organized in conformity to law, authorized by the people or accepted by them as the regularly constituted authority. See De Facto.

DEKALB′, Ill., founded in 1838 and made a city in 1877, is in DeKalb County, fifty-eight miles west of Chicago, on the Chicago & North Western, the Chicago Great Western and the Chicago, Milwaukee & Gary railroads. The Northern Illinois State Normal School is located here, and there are manufactures of wire, agricultural implements, wagons, shoes, gloves, pianos and other articles. The waterworks and a hospital are owned and operated by the city. Population, 1910, 8,102; in 1920, 7,871, a decrease of 3 per cent.

DEKALB, Johann, Baron (1721–1780), a German soldier who volunteered his services to the new American nation in the Revolutionary War. He was born in Bavaria. DeKalb entered the French army in 1743 and received several promotions, becoming lieutenant-general in 1761. Some years later he was a secret emissary of the French government in America and returned to France with a report favorable to the American cause. In 1777 he was persuaded by American representatives in Europe to join Lafayette's expedition, and upon arrival in America he was made a major-general. He served with credit throughout the war, was second in command to General Gates in the South and commanded the American forces at Camden. In this engagement he received eleven wounds, from which he died.

DE KO′VEN, Reginald (1861–1920), an American musician, one of the foremost composers of light opera. He was born at Middletown, Conn., studied at Stuttgart and Paris, and later attended Oxford University, where he was graduated in 1879. In 1887 he produced a successful light opera, *The Begum,* but his reputation became firmly established with the production of *Robin Hood,* in 1890. This was followed by many other works of similar style, including *Don Quixote, The Fencing Master, Rob Roy, The Mandarin* and *The Red Feather.* In 1917 a grand opera composed by him, *The Canterbury Pilgrims,* was produced at the Metropolitan Opera House in New York. De Koven has also composed a number of well-known songs remarkable for their sweetness of melody; *O Promise Me* is the most popular. Others include *Margery Daw, A Winter Lullaby, Indian Love Song* and *Ask What Thou Wilt.* Just before his death he wrote the opera *Rip Van Winkle.*

DELAGO′A BAY, in Southeastern Africa, is a large sheet of water separated from the Indian Ocean by the peninsula and island of Inyack. The bay stretches north and south for about seventy miles, with a breadth of from sixteen to twenty miles, and forms the southern extremity of the Portuguese settlement of Mozambique. It is available for vessels of large tonnage. The port and Portuguese city of Lourenço Marques has become a place of considerable trade since the opening of gold mines in the Transvaal.

DELAND′, Margaretta Wade Campbell (1857–), one of the foremost American novelists of the modern period. She was born in Allegheny, Pa., and was educated in private schools. She taught drawing in New York until 1880, when she married and removed to Boston. Her first novel, *John Ward, Preacher* (1888), was widely popular. Among her other books are *Old Chester Tales, Dr. Lavender's People, The Awakening of Helena Richie, The Iron Woman, The Hands of Esau, The Rising Tide* and a volume of poems. Mrs. Deland's work is characterized by true insight into character and faithful portrayal of life of to-day.

DE LA RAMEE, *de lah rah may′*, Louisa. See Ramee, De la, Louisa.

DELAROCHE, *de la rohsh′*, Paul (1797–1856), probably the greatest painter of the French school. He studied landscape painting for a short time, but applied himself afterward to historical painting and rapidly rose to eminence. His subjects are principally taken from French and English history. There is little real feeling or sentiment in his works, but the pictorical effect is present to a high degree. Among his well-known pictures are *Death of Queen Elizabeth, Princes in the Tower, Joan of Arc* and *Napoleon at Fontainebleau.*

Capitol Building

DELAWARE, one of the original thirteen states and the first to ratify the Constitution of the United States. It is next to the smallest state in the Union; its size is nearly twice that of Rhode Island. Delaware is one of the Middle Atlantic group of states. Its northern boundary forms the arc of a circle, determined by a twelve-mile radius from the center of New Castle, to settle a boundary dispute. The Delaware Bay and River and the Atlantic Ocean are on the east; Maryland is on the south and west.

The popular name of the state is the Blue Hen State, and Delaware soldiers in the Revolutionary War were called the "Blue Hen's chickens." The area is 2,370 square miles, of which 405 are water. In 1920 the population was 223,003, an average of 115 to each square mile, as compared with 31 per square mile for the entire country. Only eight of the states have a greater number of people to the square mile. The state ranks forty-seventh in area and forty-sixth in population. The peach blossom is the state flower.

Surface. Except a small, hilly section in the north, the surface is uniformly low and level and is generally sandy. In the extreme south there is much swamp land. The highest elevation is only 282 feet above the sea. The coast of Delaware Bay is marshy, and some of the land is enclosed by dykes and thus rendered tillable. The Atlantic coast has many sand beaches enclosing shallow lagoons. Near the western boundary, a low wooded ridge extends southward from the Christiana and Brandywine rivers. Cypress Swamp, on the southern border, is twelve miles long and six miles wide. The height of land between Chesapeake and Delaware bays divides the state into two drainage areas. To the west of this divide the rivers flow into Delaware River or the bay. To the east they flow into the Atlantic. The rivers of Delaware, though numerous, are all small and are unsuited to navigation.

Climate. The climate is mild and healthful, except in the south, where the swamps occasion fever. Autumn is particularly mild, and frosts seldom occur before the middle of October. The mean temperature is about 55°. The average rainfall is about forty-five inches.

Agriculture. Delaware is an agricultural state, notwithstanding it lies in the great industrial belt of the United States. Improved farm lands occupy eighty-five per cent of its entire area, nearly as large a proportion as in any other state. Delaware seems to be the natural home of the peach, while apples and small fruits and vegetables are raised in abundance for the great city markets. Although fruit-growing is the chief industry, tomatoes, cereals, hops, tobacco, peas, beans, clover seed and flax are also important products. The total value of farm products, at average prices, is about $65,000,000 per year. Corn yields the greatest cash returns, with hay second in importance. In the swampy districts are forests of cypress and evergreen trees.

Other Industries. The chief manufactories are steel and rolling mills, foundry and machine shops, ship-building yards, car shops, tanning and canning and preserving works. The principal manufactories are at Wilmington. At Dover fruit canning is the chief industry. Oyster and other fisheries are important and are growing each year. Over $70,000,000 are invested in industries, and the output is worth $60,000,000 a year at the factories.

Transportation. Numerous railways bring the coal and iron fields of Pennsylvania within easy reach and render the markets at New York and Philadelphia accessible. There were 354 miles of railroads in the state in 1918. The principle roads are the Baltimore & Ohio, the Philadelphia, the Wilmington & Baltimore, the New York, Philadelphia & Norfolk. Good harbors at Wilmington, New Castle and Lewes, the canal connecting Chesapeake and Delaware bays and the navigability of the Delaware River and Bay encourage coastwise and internal trade. A boat canal connects Chesapeake and Delaware bays, and the harbor at Lewes is protected by one of the largest breakwaters in the United States. There is some foreign commerce direct through Wilmington, the largest city.

Government. The governor is elected for four years and may be reëlected, but is not eligible for a third term. The legislative department consists of a senate of seventeen members and a house of representatives of thirty-five members. The members of the senate are elected for four years and of the house for two years. The judiciary consists of six state judges, one of whom holds the office of chancellor and chief justice. The judges are appointed by the governor and confirmed by the senate.

Recent progressive legislation includes the passage of workmen's compensation acts, the strengthening of child labor laws and the enactment of a state income tax law with $1,000 exemption.

Education. The state provides for the purchase of free text-books in the public schools. There are good schools for both white and colored children. The State Agricultural College (for colored students) is at Dover, the state capital. Newark is the

Items of Interest on Delaware

It lies on the Coastal Plain and is generally level and relatively low, the average elevation above the sea being about fifty feet; in the extreme north the country is rolling, with hills, moderately deep valleys, and rapid streams.

In general the soils of the northern part of the state are clays, sometimes mixed with loams, of the central part mainly loams, and those of the southern part sands.

The annual rainfall averages forty to forty-five inches, but it is slightly greater on the coast than inland.

Less than three-tenths of one per cent of the wage earners are engaged in mining.

The forests, which were once extensive, are no longer of commercial importance.

The fishing industry is rapidly increasing in importance.

Oysters constitute thirty-one per cent of the fisheries' product, menhaden twenty-eight per cent.

Delaware ranks second in the value of menhaden caught, but only twenty-first in the total value of fisheries' products.

Questions on Delaware

How does Delaware rank in size?

Describe its surface.

What kinds of soil are found?

What minerals are found? In what part of the state?

What is the chief product of the fisheries?

Is the fishing industry important? Why do you think so?

In which section is the land most valuable for agricultural purposes?

What is the total annual value of farm products?

Name the leading crops.

What are the principal manufactures?

How many miles of railway has Delaware?

What industries make Wilmington an industrial center?

seat of Delaware College; Wilmington, of Wesleyan Female College.

State Institutions. The Associated Charities of Wilmington has a director in direct supervision over many philanthropic institutions. These include the Home for Friendless Children, the Home for Aged Women, Saint Joseph's School for Orphan Colored Boys, the Florence Crittenton Home, the Delaware Industrial School for Girls, Home of Merciful Rest, and the Layton Home for Colored persons, all at Wilmington. There are in addition several institutions in Dover and Marshalltown, the Delaware Hospital for the Insane at Farnhurst, and the New Castle County Hospital. The Delaware State Tuberculosis Commission has general charge of the work for the prevention and cure of this disease.

History. Lord Delaware sailed into Delaware Bay in 1611, but no settlement was established until 1631, when the Dutch founded a trading post near the present site of Lewes, Del. Somewhat later the Swedes built a fort at the present site of Wilmington, and the English also contemplated entering the territory. Control alternated between the Dutch and the Swedes until 1655, when the Dutch from New Amsterdam under Stuyvesant drove out their competitors; but in 1664 Delaware, together with New York, passed into the hands of the English. After that time it became the bone of contention between rival English claimants, especially the colonies of Maryland, New Jersey and Pennsylvania, the latter finally gaining control in 1682. In 1691 it was granted a separate assembly; two years later it was reunited to Pennsylvania, but in 1711 was recognized as a separate colony. During the Revolution, Delaware was loyal to the patriot cause, formed an independent state government in 1776 and was the first to ratify the Federal Constitution (December, 1787). Under the republic it rapidly gained in wealth and population. Though a slaveholding state, it remained faithful to the Union at the opening of the Civil War, but furnished many recruits to the Confederate army. At the close of the struggle, the legislature firmly resisted the passage of the amendments, and nowhere did race hatred reach a higher point.

In recent years warring political factions of the Republican party have fought for control of the state, and as a result Delaware was long deprived of one United States Senator and from 1901 to 1904 of both Senators. The Democrats have as a result made gains in the state. In 1912 the Democrats carried the state in the Presidential election for the first time since 1892; in 1916 the Republicans won. Previous to 1892 it had been a Democratic state since 1876.

Related Articles. Consult the following titles for additional information:

Chesapeake Bay
Delaware, Thomas W.
Delaware Bay
Dover
Wilmington

DEL′AWARE, a tribe of Indians belonging to the Algonquian family, called by themselves *Lenni-Lenape*, meaning *real men*. They had to leave their original settlements in Eastern Pennsylvania and New Jersey about the middle of the eighteenth century and go farther west. Later they were removed to the Indian Territory. The few hundreds that survive are scattered among various tribes. William Penn made his celebrated treaty with the Delaware, and their famous chief Tamanend gave his name to the political organization in New York known as Tammany.

DELAWARE, OHIO, the county seat of Delaware County, twenty-four miles north of Columbus, on the Olentangy River and on the Cleveland, Cincinnati, Chicago & Saint Louis, the Hocking Valley and the Pennsylvania railroads. The Ohio Wesleyan University, a leading Methodist school, is located here. The city has a Federal building and a public library and contains railroad shops, foundries, flour mills and other manufactories. There are mineral springs in the vicinity. Delaware was the birthplace of President Hayes. The city was incorporated in 1827. Population, 1910, 9,076; in 1920, 8,756 (Federal census).

DELAWARE, or **DE LA WARR**, THOMAS WEST, Lord (1577–1618), the first British colonial governor of Virginia colony, in whose honor Delaware River, Delaware Bay and the state of Delaware were named. At the age of twenty-five he became a member of Queen Elizabeth's privy council, and in 1609 of the Council of Virginia in England. In the following year he was sent to Virginia as governor and captain general under the charter of 1609, arriving just as the discouraged colonists were about to embark for England. He displayed ability and energy as an executive and helped firmly to establish the colony on a prosperous basis. In 1611 he left Virginia for the West Indies in search of health, but was driven by storm into Delaware River. He later returned to England and died while on another voyage to America.

DELAWARE BAY, an arm of the Atlantic Ocean between the states of Delaware and New Jersey. It is about forty miles long, and its greatest width is twenty-five miles. At the entrance, near Cape Henlopen, is situated the Delaware Breakwater, which affords vessels a shelter within the cape. This breakwater was erected by the Federal government and cost about $3,000,000. See DELAWARE RIVER.

DELAWARE RIVER, a comparatively-short but very important commercial waterway of the United States. It rises in the Catskill Mountains in New York, separates Pennsylvania from New York and New Jersey, and New Jersey from Delaware, and loses itself in Delaware Bay. It has a course of about 410 miles and is navigable for large vessels to Philadelphia and for smaller craft to the head of tide water at Trenton. Its chief tributaries are the Schuylkill and the Lehigh.

DELAWARE WATER GAP, a narrow gorge in the Kittatinny Mountains, on the borders of Pennsylvania and New Jersey, through which the Delaware River flows. The mountains on each side rise to a height of 1,400 feet above the water and form very beautiful scenery.

DELCASSE′, *del ka say′,* THEOPHILE (1852–), a French statesman, prominent in World War politics. For more than twenty years he held conspicuous offices under the government. In 1914 he returned to France from Russia, to which country he had been sent as ambassador in 1913. On the outbreak of the World War he assumed charge of foreign affairs, a post he had previously held, and remained in it until October, 1915, when he resigned. It was Delcassé who was chiefly instrumental in bringing about the friendly understanding among England, France and Russia, which had such important bearings on the war in 1914.

DELFT (formerly Delf), NETHERLANDS, a picturesque town on a canal between Rotterdam and The Hague. Among the buildings are the townhall; the Prinsen-hof, now a museum, the scene of the assassination of William the Silent; the old Reformed church; the new church, containing monuments to William I and Hugo Grotius and the burial vaults of the present royal family. The town has long been famous for its earthenware, made in imitation of Chinese and Japanese porcelains, and known as Delftware. Following a period of decline, the making of this pottery enjoyed a revival after the opening of the twentieth century. Population, 1910, 34,388; in 1920, 39,539.

DELHI, *del′e,* INDIA, capital of the Indian province of the same name, and seat of the British government for all India. It is situated on the Jumna River, about 950 miles northwest of Calcutta, the former British capital. The city was founded by Shah Jehan in the seventeenth century, and was at one time capital of the Mogul empire and the largest city of Hindustan, with a population of 2,000,000. Remains of its former glory are seen to-day in its ruins of palaces, pavilions, baths and mausoleums, covering a vast tract near the site of the present city, and in the imperial palace built by the Great Mogul. This last was partly demolished to make room for military barracks, but the great towers, gilded minarets, ornate pavilions and marble dome which remain standing convey some idea of the former splendor.

The present city is flanked on three sides by a stone wall thirty feet high, and within this are many modern buildings, some of them of European architecture. The government college, the Residency and a Protestant church are among the modern architectural features. In 1911 the visit of King George and Queen Mary to India was made the occasion of a magnificent pageant known as the Delhi Durbar (see DURBAR). In the following year the capital was removed from Calcutta to Delhi.

Its political prominence has tended to make Delhi a cosmopolitan city, with many European characteristics. Modern civilization has done much to overcome caste prejudice among the inhabitants, thousands of whom are employed in the flour, cotton and sugar mills. Educational opportunities have increased in recent years, and with greater enlightenment has come civic pride and a desire for commercial progress. The political unrest which formerly disturbed the peace of mind of English residents has largely disappeared, and in its place has come a general recognition of the efficiency of the present system of government. Population, 1921, 303,148.

DELI'LAH, one of the famous women of the Old Testament, the temptress of Samson. She prevailed upon him to reveal to her the source of his strength, which was his long hair, and while he lay asleep she cut off his locks. Then she allowed his enemies, the Philistines, to capture and blind him (see *Judges* XVI). Their story has been effectively presented in dramatic form by Saint-Saëns in his opera, *Samson and Delilah.*

DELIR'IUM, the condition of being "out of one's head," due to high fever, injury to the head, or to such nervous diseases as epilepsy, Saint Vitus's dance and hysteria. In delirium the speech is disordered and incoherent, the emotions are excited and the power to reason is lost. Usually-familiar faces may not be recognized. In violent attacks of delirium the patient may do himself bodily injury, if not carefully watched. The onset of delirium during an attack of any disease is a very serious symptom. See DELIRIUM TREMENS.

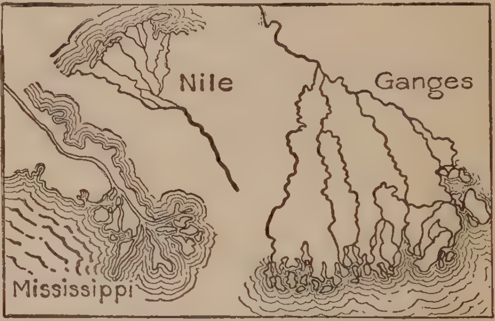
DELIRIUM TREMENS, *tre'menz,* an affection of the brain, caused by excessive drinking of alcoholic liquor. The principal symptoms of this disease are delirium and trembling. The delirium is a constant symptom, but the tremor is not always present, or, if present, is not always perceptible. Frequently the sufferer is thrown into paroxysms of terror, by thinking he sees snakes or other animals, or the most frightful and grotesque objects. The treatment of this distressing malady should be supervised by a reliable physician. Usually an attack requires the administration of powerful drugs.

DE'LOS. an island of great renown among the ancient Greeks, the fabled birthplace of Apollo. It was a center of his worship and the site of a famous oracle (see ORACLES). It is the central and the smallest island of the Cyclades group, in the Aegean Sea. Delos is now deserted except for the few who visit it for its ruins.

DELPHI, *del'fi,* a town in ancient Phocis, Greece, originally called Pytho and famous for its oracle. The oracles were delivered by a priestess, who sat on a tripod at the entrance to a cavern, on the slope of Mount Parnassus, from which issued cold vapors, supposed to be the prophetic breath of the god Apollo. The oracular utterances were always obscure and ambiguous; yet they served, in the hands of the priests, to regulate and uphold the political, civil and religious relations of Greece. Delphi was also one of the meeting places of the Amphictyonic Council of the Greeks (see AMPHICTYONIC COUNCIL), and near it were held the Pythian games. See ORACLES.

DELSARTE, *del sahrt',* FRANÇOIS ALEXANDRE (1811–1871), a musician and investigator, born at Solesmes, France. He composed a few melodies and wrote several romances, and taught singing and declamation. He was best known as the founder of a school of physical culture (which see).

DEL'TA, the name given to low island plains formed at the mouth of a river where the stream separates into two or more branches. The term originated with the Greeks, who first applied it to the plain formed by the mouth of the Nile, because of its triangular shape, resembling the Greek letter △, called *delta.*



THREE GREAT DELTAS

Deltas are caused by the meeting of the river's current with an inflow from the sea, so that the outflowing current is slackened, and most of the silt which it holds in suspension is deposited. If the sea is quiet, this action soon builds up a plain which reaches to the surface. Vegetation takes root from this, and in time it becomes firm land. Deltas will not form where the sea is agitated by strong winds or where tides produce high waves, because these movements wash away the sediment; hence deltas never exist in broad estuaries like the Gulf of Saint Lawrence. The most noted deltas in the world are at the mouths of the Nile, the Mississippi, the Ganges, the Brahmaputra, the Hoang-ho, the Po and the Mackenzie. Some of these are very large, that of the Brahmaputra having an area of 50,000 square miles, and that of the Nile, about 20,000 square miles. The land of the deltas is usually very fertile, and if of sufficient elevation to drain, it is unusually valuable for agricultural purposes. See River; Erosion.

DELUGE, *del'uje,* the name given to the great flood that covered the earth in the time of Noah, an account of which event is given in chapters six, seven and eight of the book of *Genesis.* According to the Bible narrative, the people of the earth had become so wicked that God sent a deluge which covered "all the high hills that were under the whole heaven" and destroyed all living things except those which previously had entered the Ark built by Noah. Besides Noah and his family, the Ark sheltered one male and one female of every species in the animal kingdom. After 150 days the waters began to subside, and during the seventh month the Ark rested on Mount Ararat. Then Noah sent out a dove to see if the waters had disappeared. When the bird returned for food and shelter he replaced her in the Ark and kept her for seven days. After a second trip the dove returned with an olive leaf, and when she was sent out a third time she returned no more. Then Noah knew that the waters had dried up, and that soon he and his family could return to their homes.

DEMAND AND SUPPLY. See Supply and Demand.

DEMARCATION, *de mar ka'shun,* Line of. Very soon after the discovery of the New World a dispute arose between Spain and Portugal over territorial rights in South America. The matter was referred to Pope Alexander VI for settlement. He drew a line on the map of the Americas running north and south at a distance of 600 miles west of the Azore and Cape Verde islands. To Spain he assigned all lands west of that line which Spaniards had discovered or might later find, and to Portugal he assigned all lands acquired in like circumstances to the east of that line. The location of the line was later changed by the two nations to 2,220 miles west of the Cape Verde Islands. Thus is explained why Portuguese is today the language of Brazil, and Spanish of all other South American countries. The ownership of the Moluccas and Philippines was settled in a similar way.

DEMENTIA. See Insanity.

DEME'TER. See Ceres.

DE MILLE, James (1837–1880), a Canadian educator and author, born at Saint John, New Brunswick. He was graduated from Brown University in 1854, from 1860 to 1865 he was professor of the classics in Acadia College (Wolfville, N. S.), and from 1865 until his death was professor of history and rhetoric in Dalhousie College at Halifax. His publications include *Andy O'Hara, The Soldier and the Spy, The Dodge Club, The Living Link* and *A Castle in Spain.*

DEMOCRACY, rule by the people. See Government.

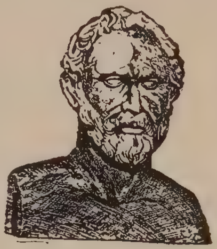
DEMOCRAT'IC PARTY, the name given to the party in American history which was the successor of the Republican or Democratic-Republican or Anti-Federalist party, its fundamental doctrine being the application of the most democratic principles to the government. Specifically, it urged the strict construction of the Constitution and the strengthening of the state governments at the expense of the national government. It first came to power in 1801, with the election of Jefferson, and retained control of the national government continuously from that time until 1825, when John Quincy Adams, a former Democrat, but recently converted to the principle of loose construction and centralization, was elected over Andrew Jackson, the Democratic candidate. It returned to power in 1829, with the election of Jackson, was defeated in 1841 by William Henry Harrison, the Whig candidate, and again in 1848 by Taylor, a Whig, owing to a quarrel among New York State Democrats (see Barnburners). Thereafter, it was continuously successful until the election of Lincoln in 1860.

The issue of slavery and the Civil War caused a serious division in the party, and it did not again become united until ten years after the war, when, with Samuel J. Tilden as a candidate, the party gained a majority of the popular vote, though Tilden was defeated by the electoral commission (see Electoral Commission). In 1884 its candidate, Grover Cleveland, was chosen president, was defeated in 1888 and was again elected in 1892.

After 1892 the Democrats lost the contests of 1896, 1900, 1904 and 1908, but returned to power with the election of 1912 and retained control by success at the polls in 1916. See Political Parties.

For a detailed history of the party, its principles and its relations to other parties, see Political Parties in the United States.

DEMOSTHENES, *de mos′the neez* (about 383–322 B. C.), the most eloquent orator of antiquity, perhaps the greatest of all time, and one of the noblest characters in history. His father left him a considerable fortune, of which his guardians attempted to defraud him. At the age of seventeen he conducted a suit against them himself and gained his cause. His success led him to study oratory and, though his lungs were weak, his articulation defective and his gestures awkward, by perseverance he at length surpassed all other orators in power and grace. Against Philip of Macedon, who was attempting to place himself at the head of the Greek states, he directed his famous condemnatory orations known as the *Philippics.*



DEMOSTHENES

He was present at the Battle of Chaeronea (380 B. C.), in which the Athenians and Boeotians were defeated by Philip and Greek liberty was crushed. On the accession of Alexander in 336, Demosthenes tried to stir up a general rising against the Macedonians, but Alexander at once adopted measures of extreme severity, and Athens sued for mercy. It was with difficulty that Demosthenes escaped. In 324 he was imprisoned on a false charge of having received a bribe from one of Alexander's generals, but managed to escape. On the death of Alexander in the next year he returned from exile, but when the Greeks were again defeated by the Macedonians he was forced to leave. This time he took refuge in the temple of Poseidon, in the island of Calauria, on the coast of Greece. Here it is believed he poisoned himself to escape the emissaries of Antipater.

DEMURRER. *de mur′er,* a pleading in a case at law which seeks the court's judgment as to (1) whether the facts, even if admitted, are not insufficient to sustain the opposing claim, or (2) whether some other defect in the presentation of the case does not constitute a legal reason why the opposing party should not be allowed to proceed.

DENA′RIUS, a Roman silver coin, originally worth ten, and later sixteen, of the pieces called *as,* the change being made when the weight of the *as* was reduced, on account of the scarcity of silver. The denarius was equivalent to about fourteen cents of American and Canadian money. There are also a gold denarius, equal in value to twenty-five silver ones.

DENATURED ALCOHOL. See ALCOHOL, subhead *Denatured Alcohol.*

DENISON. TEXAS, a city in Grayson County, seventy-four miles north of Dallas, on the Frisco, the Missouri, Kansas & Texas, the Texas & Pacific, the Houston & Texas Central, the Missouri, Oklahoma & Gulf railroads and an interuban line. It is an important railroad center in an agricultural country, producing grain, cotton, peanuts, fruits and vegetables, and it contains cotton, cottonseed oil, peanut and flour mills and manufactures of mattresses, machinery, ice and other articles. The important buildings include the Saint Francis Xavier's Academy, a Union depot and a Federal building. There are two hospitals. The town was settled in 1872. Population, 1910, 13,632; in 1920, 17,065, a gain of 25 per cent.

A Danish peasant girl

DENMARK, the smallest of the three Scandinavian kingdoms of Europe, the others being Norway and Sweden. It consists of the continental peninsula of Jutland and a number of islands, of which the most important are Fünen and Zealand. On the latter is the northern portion of the capital city of Copenhagen; the southern portion occupies the adjacent coast of the small island of Amager. Including the Faroe Islands, north of Scotland, the Danish kingdom has an area of 17,144 square miles, and is more than twice as large as Massachusetts. In 1921 the population of Denmark proper was 3,289,195, about one-fifth greater than that of the city of Chicago. There are 191 people to the square mile, as compared with about 146 for Maryland.

Denmark is a kingdom in the sea, for it has but one land boundary. It is separated from Norway on the north by the Skagerrak; from Great Britain on the west by the North Sea; and from Sweden on the east by the Baltic Sea, the Sound and the Cattegat; Schleswig-Holstein, which became a part of Prussia in 1866, but was originally Danish, lies to the south of Jutland on a boundary line less than forty miles in extent. At the close of the World War Denmark entered a claim at the Peace Conference for the return of a portion of Schleswig-Holstein—that portion still Danish in language and sentiment. This matter was to be decided by a vote of the people of the district.

Surface and Drainage. The west coast of Jutland is low and sandy, while the east coast is level, contains several excellent harbors and is indented with fjords or firths, the most noteworthy being the Lymfjord, or Lumfjord, stretching across Jutland. The inland surface of Denmark is low, generally, though diversified with a range of hills across the middle part of Jutland, the highest points of which are 600 feet above sea. There are no lakes or rivers of note, the largest river being the Guden, which is less than 100 miles long.

Industries. Denmark is the poorest of European countries in mineral resources. Peat is found in the west and north of Jutland, nearly four per cent of the country being in peat bogs, but no metallic ores of any kind appear.

Agriculture is the occupation of over one-third of the people. As the formation of large estates is forbidden by law, the land is divided into numerous small farms, most of which are owned by peasants. About one-third of the land is cultivated; the remainder of the productive area is pasture and meadow land or beech forests. Danish farmers are thrifty and progressive and make extended use of up-to-date machinery. The chief crops are wheat, rye, barley, oats, mixed grain, potatoes and sugar beets. Dairying is carried on extensively and Danish dairy products are among the best in the world. England imports each year great quantities of butter and eggs produced in Denmark.

Manufacturing is increasing in importance, though there are no single great enterprises. Porcelain is made extensively in Copenhagen, and other manufactures include locomotives, machinery, wool, linen and cotton. There are also a number of beet-sugar factories. Fishing is an important industry, the country's fishing fleet numbering in 1918 over 15,300 vessels.

Transportation. Most of the cities are situated on the coast or on navigable rivers. Steamboats run between the islands. The first railroad was opened for use in 1847; in 1918 there were 2,550 miles in operation, one-half belonging to the state. The exports are mostly animal and dairy products, while the imports include cereals, coal, cotton, iron, manufactures and textiles. Germany, Great Britain, United States, Sweden, Norway and Russia are the leading countries connected with the trade.

Education. Denmark has a good system of education, for education was made compulsory in 1814. The chief institution is the University of Copenhagen, founded in 1479. There are besides, nineteen agricultural colleges, 189 technical schools, a college of pharmacy, a college of dentistry, and a Royal Academy of Arts.

Government and Religion. In government Denmark is a constitutional monarchy. The present constitution dates from 1915; by it the executive power is vested in the king, and the legislative power lies in the king and a diet, or *Rigsdag,* consisting of the *Landsthing,* or upper house, and the *Folkething,* or popular chamber. The former is composed of seventy-two members, twelve of whom are appointed by the king and the rest chosen for eight years by the people. The *Folkething* is composed of 140 deputies, elected by both male and female suffrage for a period of three years. All money bills must be submitted by the government first to this body. The established religion is Lutheran, but toleration is extended to all creeds.

Colonies. Denmark's colonies are not of first importance. Iceland in 1918 was made practically independent; Greenland has a large area, but is habitable only in the lower coast region; the Danish West Indies were sold to the United States in 1917. There remain to Denmark the Faroe Islands (540 square miles and 19,000 people), which form a department in the government.

Language and Literature. The Danish language belongs to the Scandinavian branch of the Teutonic family of languages and is closely allied to the Swedish and Norwegian. It is the most modern of the Scandinavian languages, soft and rather monotonous, with shades of sound difficult for a foreigner to acquire. It is written either in the German or the Roman characters. From the long union of Norway with Denmark, Danish became the written language of the Norwegians and is still to a large extent the language of the educated classes.

The oldest Danish book is a treatise on medicine, which dates from the first half of the thirteenth century. The first really literary writings were series of ballads, which were probably composed between the fourteenth and sixteenth centuries. During the Reformation period, Christian Pedersen (1480–1554) did for the Danish language what Luther did for the German, by publishing a translation of the New Testament and the Psalter, and later, the complete Bible. Modern Danish literature begins with the period succeeding the Reformation, with hymns, scriptural dramas and moral tales. A new effort began with Ludvig Holberg (1684–1754), who infused new spirit into all branches of Danish intellectual life. He was also the founder of the Danish stage. Contemporary with him was the lyric and dramatic poet Johannes Ewald. Heiberg, critic, poet and dramatist, and Jens Baggesen (1764–1826), are the chief comic dramatists of the nation. Fresh life was again infused into Danish poetry by Adam Oehlenschläger (1779–1850), contemporary with whom was Adolph Wilhelm Schack von Staffeldt, a lyric poet of high order. The greatest names in Danish literature since Oehlenschläger have been Hans Andersen (1805–1875), who won world-wide reputation by his fairy tales; Paludan-Müller (1809–1876), and Georg Brandes, critic and literary historian. It is Brandes who has, more than any other one man, introduced into Danish thought and letters modern European ideals and tendencies.

History. After the decline of the Roman Empire, the peoples of the Scandinavian countries began to make themselves felt throughout Europe by reason of their warlike and adventurous spirit. They conquered Normandy, successfully invaded England in the ninth century and even sent voyagers as far as America. Early in the eleventh century, Canute, king of Denmark, established a firm hold on England. He was one of the most powerful rulers of his age, and it was during his rule that Christianity was firmly established in Denmark. For three centuries following Canute, Denmark was in a state of upheaval and, although there was an occasional strong and even brilliant ruler who brought the country to something like the position it had had in Canute's time, most of the kings were weak.

Margaret, called the "Semiramis of the North," ruled in Denmark from 1375 to 1412, and she gave the country a strong government. By the Union of Kalmar, in 1397, Denmark, Norway and Sweden were united under one sovereign, and Margaret's nephew, Eric, was appointed her heir. He proved, however, to have none of her great qualities, and he speedily lost his triple kingdom, each country choosing its own ruler. By 1448 the Danes, tired of the misrule, chose, as king, Christian of Oldenburg, who established the line which reigned until 1863. The choice of Christian as ruler, also, of Schleswig and Holstein, and the fact that the ruler of Holstein, which was a part of the Holy Roman Empire, had a voice in the German Diet, led centuries later to the most important consequences.

During the reign of Christian II (1513–1523), Sweden, under Gustavus Vasa, gained its freedom, and it was never again united to Denmark. The latter country during the sixteenth century began to have a part in European affairs, and Christian IV (1588–1648) took an important part in the Thirty Years' War. The choice of the king of Denmark was by election until 1660, but in that year the king, Frederick III, succeeded in having the kingship declared hereditary in his family.

As an ally of Napoleon, Denmark was involved in war with Sweden, England, Russia and Prussia. Copenhagen was bombarded by the British fleet in 1807, and seven years later Norway was ceded to Sweden. Holstein, feeling itself to be entirely German, had never been satisfied with the Danish rule, and when in 1846 the Danish king declared his intention of making the Danish monarchy permanently indivisible, a rebellion broke out in Schleswig and Holstein among the German element. It was put down by 1851, though it was supported by Germany. Christian VIII had in the meantime granted to Denmark an extremely liberal constitution, but this did not allay the discontent of the German element of Schleswig-Holstein, and when in 1863 Prince Christian of Glücksburg came to the throne as Christian IX, Schleswig and Holstein declared for a different ruler. Prussia and Austria determined to unite in settling the Schleswig-Holstein matter, and war was begun with Denmark in 1864. As a result Denmark was forced to resign all claims to Schleswig and Holstein, and two years later the duchies passed finally under the control of Prussia. Denmark, through the marriage of the children of Christian IX into many reigning families of Europe, came during the latter half of the nineteenth century into very close relationship with many of the European powers. In 1906 Christian IX was succeeded by his son, Frederick VIII, who died in 1912. The successor of Frederick VIII was Christian X.

In 1914, upon the outbreak of the World War, the position of Denmark and of its sister Scandinavian countries became perilous. The fate of a small, resisting nation was seen in the German treatment of Belgium, therefore the kings of Denmark, Norway and Sweden, late in 1914, met in conference and determined upon a policy of strict neutrality. This they maintained well, considering all circumstances.

Related Articles. Consult the following titles for additional information:

Andersen, Hans C.
Brandes, Georg
Canute
Christian IX
Christian X
Copenhagen
Faroe Islands
Frederick VIII
Greenland
Iceland
Jutland
Northmen
Schleswig-Holstein
Thorwaldsen, Bertel
World War
Zealand

DENSITY, in physics, the quantity of matter contained in any given substance per unit of its volume. When a body, mass or quantity of matter is spoken of, its weight is always understood, that being the measure of the density. Two bodies may be of the same size, but of different density. A cubic inch of snow is not so dense as a cubic inch of ice. If the latter is fifty times the weight of the other it has fifty times the density. If the snow is compressed until it is one-fiftieth its former size it will be of the same density as the ice. Hence the maxim: density is directly proportional to the quantity of matter and inversely proportional to the bulk or magnitude. See GRAVITY, SPECIFIC.

DEN′TAL SCHOOLS, professional schools founded for the purpose of giving technical training in dentistry and dental surgery. The first school of this sort in the world was established at Baltimore in 1839. Six years later the Ohio College of Dental Surgery was founded, and this was followed by a school in Pennsylvania; then others were organized in rapid succession. Most of the larger universities now maintain dental departments. These departmental schools and the independent schools in the United States number about sixty. The requirements for admission in most of these schools are a high school course or its equivalent, but there is a growing belief that a college course should be the minimum admission requirement. Most of the best schools require four years' study and practice for graduation. See DENTISTRY.

DENTIPHONE. See AUDIPHONE.

DEN′TISTRY, the art of cleaning, extracting, repairing and replacing teeth. There are two very distinct departments in dentistry, the one being *dental surgery*, the other what is known as *mechanical dentistry*. The first requires an extended medical knowledge on the part of the practitioner, as, for instance, a knowledge of diseases whose effects may reach the teeth, of the connection between the welfare of the teeth and the general system, as well as ability to discern latent diseases of the mouth. The chief operations in this department are *scaling*, or removing the tartar which has accumulated on the base of the teeth; *regulating*, the restoring of overcrowded and displaced teeth to their proper position; *filling*, the filling up of the hollow of a decayed tooth to prevent the progress of decay; *extracting*, a process requiring muscular power and delicacy of manipulation.

The second department, mechanical dentistry, is concerned with the construction of artificial substitutes for lost teeth and requires much mechanical skill, it being a very delicate task to give artificial teeth a perfectly natural appearance in shape and color. The actual construction of the teeth, however, has passed largely into the hands of the manufacturers, and the dentist has only the selecting, fitting and fixing to do. Also, laboratories in all large cities relieve the practicing dentist of all mechanical work in connection with the making of plates, inlays, bridges, crowns, etc.

The terror inspired by the extractor's forceps has been practically eliminated by the establishment of specialist's offices where the dental operator has become unusually proficient in this phase of work and has at his command all the modern devices for the alleviation of suffering. This extracting specialist employs a compound of nitrous oxide and oxygen to induce unconsciousness while extraction takes place; this recently-discovered anesthetic rarely leaves ill effects, even of temporary character. See TEETH; DENTAL SCHOOLS.

DENVER, Colo., a city located on a plain one mile above the sea, in a region famed for the beauty of its scenery and the attractiveness of its climate. It is the capital and metropolis of the state, and the county seat of Denver County, and lies nearly midway between San Francisco and Chicago, being 1,457 miles east of the former, and 1,050 miles west of the latter. New York City is 2,025 miles east. About twelve miles to the west rise the foothills of the Rocky Mountains, and in the clear air of that region almost every day of the year a chain of picturesque summits may be seen for a stretch of 200 miles, extending north and south. The average annual rainfall of Denver is about fourteen inches, and the sun shines 275 days of the year. The temperature for the hottest days is 72°, on the average, and in January it averages 29°.

General Description. The city has an area of sixty square miles, and is divided by the South Platte River and Cherry Creek into East, West and North Denver. With its miles of broad, shaded streets, lined with substantial homes and buildings, it presents a very attractive appearance. Disintegrated granite and asphalt are used extensively for paving purposes, and there are many beautiful drives traversing and connecting the parks and leading to the mountain resorts in the vicinity. Of the public parks, with a total acreage of over 1,000, City Park (320 acres) is the most pretentious. It has as special features a lake, zoölogical gardens, a museum of natural history, an aviary and a speedway. Other attractive parks are Cheesman, Berkeley and Washington, and there are about a dozen children's playgrounds. The street car service is excellent, and the supply of pure water from the mountains is abundant.

Important Buildings. The most prominent structure is the state capitol, occupying an eminence in the east-central part of the city and constructed of Colorado granite at a cost of $2,800,000. Among other notable edifices are the United States Mint, a county courthouse, a spacious Auditorium, which accommodates 12,000; a Federal building, erected at a cost of $2,000,000; a Union Depot and a Carnegie Library. The many handsome churches include Trinity Methodist Episcopal and Roman Catholic (Immaculate Conception) and Episcopal (Saint John's) cathedrals.

Institutions. The University of Denver, under Methodist control, the Jesuit College of the Sacred Heart, Westminster College (Presbyterian), Colorado Woman's College and Loretto Heights Academy are important institutions of higher learning. Libraries are numerous and include, besides those connected with the colleges and the well-equipped public library, the state library and that of the supreme court. The city also possesses a number of excellent sanatoriums and hospitals, for it is visited by large numbers of tubercular patients.

Industry and Commerce. The industries dependent upon or connected with mining and live-stock raising are of great and increasing importance. There are large establishments for the smelting of lead, copper, iron, gold, silver, radium and uranium, and their annual output has a value approximating $8,000,000. The stadium built to house the annual stock show, which is second only to that held in Chicago, cost $250,000, and the slaughtering and meat-packing plants do a thriving business. Other important plants include sugar beet factories, foundries and machine shops, railroad construction and repair shops, manufactories of mining machinery, and numerous factories producing a wide variety of articles in general use.

The city is the largest distributing point in the Rocky Mountain section, and carries on a large wholesale jobbing trade. Because of its excellent situation, Denver has become an important railway center, and the roads entering the city have been a great factor in its industrial development. These roads include the Union Pacific, the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Colorado & Southern, the Denver & Rio Grande and the Missouri Pacific. Electric interurban lines extend to near-by towns and resorts.

History. The city was settled in 1858 as Auraria, on the west side of Cherry Creek, and as Saint Charles, on the east side. In the following year the rival villages were united and incorporated as a city and named Denver, for General J. W. Denver, who at the time was governor of the territory of Kansas, which then included Colorado. It was made the capital of the territory of Colorado in 1867, and was the county seat of Arapahoe County until 1902, when it became "The City and County of Denver" and was vested with unusual powers and prerogatives, including a form of initiative and referendum. Population, 1910, 213,381; in 1920, 256,491.

DENVER, University of, an institution of higher learning, founded by Governor John Evans at Denver, Colo., in 1864, under the name of Colorado Seminary. Since 1880, when it was reorganized, it has borne its present name. It is under Methodist control. The main campus is at University Park, a suburb of Denver. Here are located the college of liberal arts, the graduate school, the summer school and Warren Academy. In Denver are situated the schools of law, commerce and dentistry and teachers' college. The faculty numbers about 200 in normal years; and the student enrollment over 1,800. There is a library of 40,000 volumes.

DEPARTMENT, one of the eighty-seven territorial divisions of France, which since 1790 have replaced the old provinces. Each department is subdivided into *arrondissements,* or congressional sections. These are further subdivided into *cantons,* or electoral districts, and the cantons into *communes.* At the head of each department is a *prefect,* appointed by the President of the republic.

DE PAUW, *de paw′,* **UNIVERSITY**, a Methodist Episcopal institution of higher learning, founded at Greencastle, Ind., in 1837, and named for W. C. De Pauw, by whom it was liberally endowed. The institution comprises a college of liberal arts and a school of music. In 1917 two new buildings were erected—Rector Hall, a dormitory for women, and an administration building, the Studebaker Memorial. The institution has about fifty instructors, more than 1,200 students and a library of 50,000 volumes.

DEPEW, *de pu′,* Chauncey Mitchell (1834–), an American orator, lawyer and legislator, born in Peekskill, N. Y., and graduated at Yale University in 1856. He has held public offices, among them that of secretary of state of New York, and has been prominent as a railway attorney. From 1899 to 1911 he was United States Senator from New York. Depew's reputation rests chiefly upon his ability as a public speaker, especially on festal occasions.

DE QUINCY, *de kwin′sy,* Thomas (1785–1859), a celebrated English author, born in Manchester. In 1803 he matriculated at Oxford, and it was in the second year of his course there that he began to take opium in order to relieve severe neuralgic pains. A habit was formed which gained strong hold on him, but after years of indulgence in it he was able partially to overcome it and do regular work.

On leaving college he settled at Grasmere, Westmoreland, near Wordsworth and Southey, and there devoted himself to literary work, reading voraciously and writing for the *London Magazine, Knight's Quarterly Magazine* and latterly *Blackwood's Magazine.* From 1828 to 1840 he lived in Edinburgh, then removed with his family to Lasswade. His *Confessions of an English Opium Eater,* which was published in the *London Magazine* in 1821, first won him wide notice, and it has remained his chief contribution to literature. Among his other works are *Murder Considered as one of the Fine Arts, The English Mail Coach, Joan of Arc, Literary Reminiscences,* in which he deals with Lamb, Coleridge, Wordsworth and Southey, as well as Shelley, Keats, Goldsmith, Pope and others; and a very interesting series of *Autobiographic Sketches.*

DER′BY, (pronounced *dahr′by* in England), capital of Derbyshire, England, and an important commercial center. It is beautifully situated on the Derwent River, forty-five miles northeast of Birmingham, and is in direct rail and water communication with all parts of England. The principal manufactures are lace, silk, cotton, paper, and porcelain. All public utilities are economically and efficiently managed by the city. Derby is one of the oldest towns in England and is supposed to owe its origin to an ancient Roman station, Derventio, which was situated on the opposite side of the river. Population, 1921, 129,836.

DE RESZKE, *de resk′ke,* the family name of two brothers who won fame as singers in grand opera. Both were born in Poland.

Jean de Reszke (1850–) became one of the greatest tenor stars of his time. His voice early attracted attention, and after studying under eminent instructors he made his début in Venice in 1874 as a barytone. The appearance was far from a success, and he retired, reappearing in 1879 at Madrid in the tenor rôle in Massenet's *Herodiade.* Thereafter his career was a succession of great triumphs, for he not only possessed a beautiful voice, but he was gifted with dramatic ability, and his appearance was very pleasing. He was popular both in Europe and America, appearing in *Aïda, The Huguenots, Faust, Lohengrin* and other favorite operas. In 1904 he retired from the stage.

Edouard de Reszke (1855–1917) was a bass singer of great ability and popularity. He made his début in Paris in 1876. After 1884 he made several tours of the world, singing in leading operatic rôles, and for more than ten years he was engaged almost continuously with the Metropolitan Opera Company of New York City. He died on his estate in Poland, to which he had retired in order to help his suffering countrymen during the World War.

DER′RICK, a device for lifting heavy weights and moving them short distances. It is the most common form of the crane (which see). The derrick usually has a tall mast, supported by ropes attached to its top and anchored to the ground. In the foot of the mast is a strong iron pin, which fits into a socket in the base upon which it rests. A boom is attached to the mast a few feet from the ground and can have its upper end lowered or raised as desired. The boom contains the tackle blocks used in lifting the weight (see BLOCK). A rope connects the tackle block with a system of wheel work at the foot of the mast, to which the power is applied. The weight is moved by turning the mast and thus swinging the boom around.

DERVISH, *dur′vish,* a general term applied to any Mohammedan religious fanatic distinguished by certain observances and practices. Some of the dervishes lead solitary lives, while others live in monasteries. They are respected by the common people, and the mendicants among them carry a wooden bowl into which the pious cast alms. One of their forms of devotion is dancing, or whirling about; another is shouting or howling, uttering the name *Allah,* making violent motions of the body, till they work themselves into a frenzy and sometimes fall down foaming at the mouth. They are credited with miraculous powers and are consulted for the interpretation of dreams and the cure of diseases.

DESCARTES, *da kahrt′,* RENE (1596–1650), the "father of modern philosophy." He was educated at the Jesuit College at La Flèche, where he gave evidence of remarkable intellectual power. After spending five years in Paris and eleven years in traveling and as a soldier, he settled in Holland, where he developed his philosophical system.

Early in life Descartes recognized the inconsistencies of the various systems of philosophy and sought to found an entirely new system. Asserting that all the knowledge of his day was without firm foundation, he decided to begin his speculations by doubting everything that could be doubted. The only incontestable fact to him was that of his own existence, proof of which was furnished by the fact that he doubted. Hence he begins with the proposition: I think, therefore I exist (*Cogito, ergo sum*). Satisfied with this criterion of the certitude of his existence, he argued further that God exists, inasmuch as the idea of an absolutely perfect being could not originate in finite mind unless that mind were a part of the perfect and infinite and conscious of itself. See PHILOSOPHY.

DESCHANEL, PAUL EUGENE LOUIS (1856–1922), President of France, succeeding Poincaré, the great war President, in 1920. He was educated in the College of Saint Barbe, and entered at once upon a public career. After filling minor offices he was made vice-president of the Chamber of Deputies in 1896; two years later he became its president. Deschanel has since served on commissions connected with colonial affairs and in other departments of the public service. In September, 1920, failing powers compelled him to resign the Presidency, after an incumbency of less than one year.

DESERT, *dez′urt,* a region with little or no plant life. Absence of vegetation may be due either to extreme heat, as in the case of Sahara, or to lack of heat, as in the case of the tundras of Siberia. The surface of deserts is usually uneven, being broken by dunes formed by drifting sand and gravel, and bluffs that have been sculptured by rivers which traversed the region in former ages. In nearly all cases the soil is fertile and only needs water to make it productive. This has been amply demonstrated by irrigation in deserts in the United States and other parts of the world. Deserts are due to three causes: to warm winds which dry the earth but bring no rain; to distance from the sea, in which case the clouds discharge before reaching the dry area; to mountains which intercept the rain-bearing clouds.

Deserts are found in all the continents, the most extensive areas occurring in Asia, Africa and Australia. The Sahara, the most widely known, extends across Africa from east to west, between the twentieth and thirtieth parallels of north latitude. A continuation of this is the Arabian Desert and the great Desert of Gobi in Asia. The Kalahari Desert occupies a large region in South Africa between the Zambesi and the Orange and Limpopo rivers. In the central part of Australia is also a large desert region. Another occurs in the northern part of Chile in South America. In the United States there is a chain of deserts lying between the Rocky and the Sierra Nevada mountains and extending from Mexico into Canada.

DES MOINES, Iowa, the capital and largest city of the state and the county seat of Polk County, is slightly south of the geographical center of the state, 170 miles west of the Mississippi River. The city is a meeting point of eight railroads—the Chicago, Rock Island & Pacific, the Chicago & North Western, the Fort Dodge, Des Moines & Southern, the Chicago Great Western, the Wabash, the Chicago, Milwaukee & Saint Paul, the Chicago, Burlington & Quincy, the Minneapolis & Saint Louis—and several interurban lines. The Raccoon and the Des Moines rivers divide the city, and are crossed by fine bridges.

The public buildings are the state capitol, costing $3,000,000, the State Historical building, costing $500,000, containing a rare collection of relics and papers pertaining to the state's history, the public library, the new post office, the county building, costing $1,000,000, the new municipal building, the Coliseum, seating 10,000 people and erected by popular subscription, the Auditorium, seating 3,000 people and the Y. M. C. A. and Y. W. C. A. buildings. Des Moines is the home of Drake University (Disciples of Christ), Highland Park College (Presbyterian), Des Moines College (Baptist), and Grand View College (Lutheran). The city has about 100 churches.

Des Moines is governed by a system of municipal administration known as the *Des Moines Plan,* which is a modified form of the commission plan (see Commission Form of Government). All the city affairs are handled by a council of five men, each of whom has charge of a special department. The initiative and referendum are embodied in the Des Moines Plan.

Des Moines is the third city in the United States in the distribution of farm implements and is the great wholesale center for the state. The important manufacturing establishments include medicine works, garment factories, a large packing house, and various other factories producing starch, flour, wagons, washing machines, furniture, wall paper, scales, furnaces, engines, soap, cigars, electrical appliances and numerous other articles.

An army post known as Fort Des Moines is located just outside the city limits. When the United States entered the World War the government established Camp Dodge here for the training of contingents of the new army. The town of Fort Des Moines was platted in August, 1846. A new charter was adopted in 1852, and the prefix *Fort* was dropped from the name of the city. On February 16, 1857, the state capital was moved to Des Moines. Population, 1910, 86,368; in 1920, 126,468.

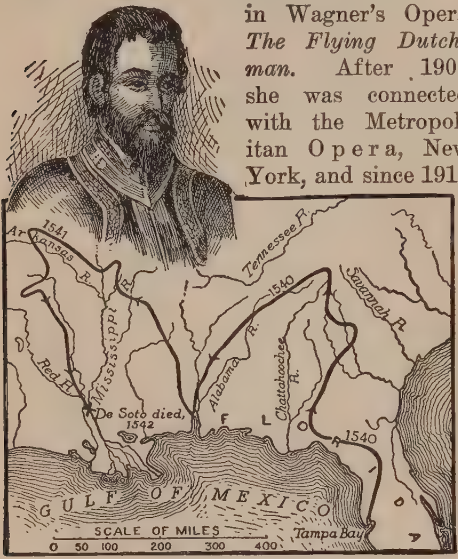
DES MOINES RIVER, an important river in Iowa, formed by the meeting of two streams in Humboldt County. It flows south-southeast through Iowa, through a rich agricultural region, to a point about four miles below Keokuk, and then empties into the Mississippi River. The affluents are the Raccoon, North, Middle, South and Boone rivers. Its length is estimated at 500 miles, and it drains an area of over 14,000 square miles. Des Moines, Fort Dodge and Ottumwa are the principal cities on its banks.

DE SOTO, Fernando (1496–1542), a Spanish explorer, the discoverer of the Mississippi. He accompanied several expeditionary parties to the New World and took a distinguished part in the conquest of Peru. In 1539 he led an expedition to Florida, and afterwards penetrated the country just west of the Mississippi. Here he was attacked with fever, died and was buried in the river. The rest of his party, scarcely one-quarter of the original number, found refuge in the coast settlements of Mexico. Not all of them reached Europe again.

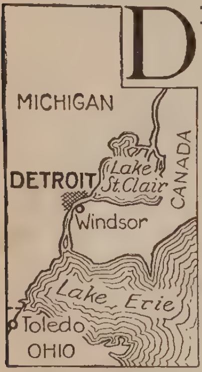
DESTINN, *des'tin,* Emmy (1878–), an operatic soprano born in Prague, Bohemia. She began her musical education with lessons on the violin. When the exceptional possibilities of her voice became apparent, she decided to prepare herself for an operatic career. In 1897 she made her début at the Royal Opera House, Berlin, in the rôle of

Santuzza, in *Cavalleria Rusticana,* using the name of her teacher, Madame Loewe-Destinn, instead of her family name Kittl.

Her reputation was established in 1901 when she appeared with distinction as Senta in Wagner's Opera *The Flying Dutchman.* After 1908 she was connected with the Metropolitan Opera, New York, and since 1915 has been a naturalized American. Her repertory includes the leading soprano rôles of *Aïda, Mignon, Tannhäuser, The Magic Flute, La Boheme, Madam Butterfly* and many others. Her voice is familiar to all discriminating buyers of phonograph records.



FERNANDO DE SOTO AND MAP OF HIS JOURNEYING



DETROIT, Mich., the county seat of Wayne County, the largest city of the state and fourth among the cities of the United States, is situated on the narrow, straitlike Detroit River, in the southeastern part of the state. It is eighty-eight miles southeast of Lansing, sixty-two miles northeast of Toledo, Ohio, and 284 miles northeast of Chicago. Because of its situation Detroit is called the *City of the Straits* and the *Dardanelles of America.* Within recent years it advanced to the position of first city in the world in the manufacture of automobiles; this city produces over half of the entire product for the United States. Detroit has excellent railroad facilities, being served by the Grand Trunk, the Michigan Central, the New York Central, the Wabash, the Detroit, Toledo & Ironton, the Pere Marquette and the Canadian Pacific. It has steamship connection with all important ports on the Great Lakes, and there is ferry-boat connection with Windsor, Ont., on the opposite side of the river.

General Description. Detroit extends along the river for eleven miles, and is built on ground sloping gently from the bank. It has an area of over forty-one square miles. The city is regularly laid out, one set of streets running parallel with the river, and another set crossing them at right angles. In the central and older portions of the city, however, the streets radiate from a semicircular plot known as the Grand Circus Park, and from a second central point called Campus Martius, and near these the blocks are somewhat irregular, a number of them being triangular.

Woodward Avenue, which divides the city into two nearly equal parts, is one of the important thoroughfares. In the downtown district it is devoted to business purposes, but beyond this district it is largely a street of churches, temples, club houses and garages. Jefferson Avenue, which runs parallel with the river, is another important business and residence street. Griswold Street is the financial center. Many of the handsome homes of the city are found on Cass Avenue, Boston and Chicago boulevards, and Grand Boulevard, the most beautiful of all. The latter is twelve miles long.

Detroit has over thirty parks. The largest and most noted is Belle Isle, which includes the entire island of this name in the Detroit River, and has an area of 704 acres. It is laid out with beautiful walks, drives, flower gardens and lagoons, and contains a comprehensive zoölogical collection, including a fine aquarium. It also has a commodious and admirably planned bathing beach. The island is connected with the city by a magnificent bridge, built at a cost of $300,000. Grand Circus, from its location, is an important park, though it contains only about six acres. Situated as it is in the center of the business district, it affords excellent opportunity for rest. It is divided into two equal parts by Woodward Avenue. Palmer, Clark, Owen and Cass parks and the water works grounds are also worthy of mention. Besides these there are numerous interesting and beautiful places along the river, which during the summer are reached by excursion steamers that ply regularly between them and the city. Elmwood and Mount Elliot cemeteries in the eastern part of the city are noted for their drives and monuments. Other cemeteries noted for their beauty are Woodmere, Woodlawn and Mount Olivet.

Buildings. The most important of the city's buildings include the county courthouse, the $2,500,000 Federal building, the city hall, facing the Campus of Martius, the old and new post offices, the Chamber of Commerce, the Dime Savings Bank, Ford, Penobscot, Kresge and Majestic office buildings, the Detroit Athletic Club House, the Masonic Temple, the Y. M. C. A. and the Pontchartrain, the Stadtler and the Cadillac hotels. Another noteworthy building is the Michigan Central station, built at a cost of $2,000,000. Facing the city hall is the Soldiers' and Sailors' Monument, consisting of a granite shaft, 55 feet high, surmounted by a colossal bronze statue representing Michigan. Among the churches worthy of mention are the Saint Paul's Episcopal Cathedral, Saint Hedwig's, Saint Leo's and Saint Joseph's Roman Catholic churches, the Central Methodist, the First and Fort Street Presbyterian, the Woodward Avenue Baptist, the First Congregational and the Jewish Temple, Beth-El.

Institutions. Among the educational and charitable institutions worthy of mention are the public library, which has nine branches; the Museum of Art; Detroit University (Jesuit), Michigan College of Medicine and Surgery, Detroit College of Law and Detroit Homeopathic College. There are homes for the destitute and other unfortunates, a splendidly equipped House of Correction and several hospitals, including the Red Cross, Saint Mary's, Herman Kiefer and the United States Marine.

Commerce and Manufactures. The river front is lined for miles with wharves, elevators and warehouses, and there has been built here the largest dry-dock on the Great Lakes. The river forms a deep and commodious harbor, admitting vessels of the largest size, and it is one of the busiest waterways in the world. The channel is guarded by Fort Wayne, for cargoes of priceless value, enormous shipments of grain and ore, pass through the strait. To care more easily for the extensive traffic in freight and passengers, the Michigan Central Railroad recently completed a tunnel under the river connecting the Michigan and Ontario sides. The city ranks first among the ports on the northern border of the country in amount of foreign trade, and in value of exports it is exceeded only by New York, Galveston and New Orleans.

When America entered the World War the leading industry in Detroit was the manufacture of automobiles, which had reached mammoth proportions. War demands had reduced the output of pleasure cars fifty per cent by the middle of 1918, and there was a further curtailment in 1919. But the great automobile plants were modified to suit the needs of the nation, and Detroit became a great center for the manufacture of munitions, tractors, torpedo-boat destroyers, trucks, etc. In addition, the city carries on extensively the manufacture of adding machines, chemicals and tobacco products. Its great shipyard is one of the largest on the Great Lakes; it has one of the largest seed houses in the world, and there are important tanning and meat-packing establishments.

History. The first settlement was made by the French under Cadillac in 1701, and was a fortified trading post. In 1763, at the close of the French and Indian Wars, the place was besieged by the Indians under Pontiac for several months, but was saved by the heroism of its defenders. During the Revolutionary War it was the headquarters for the British forces in the Northwest and the point from which numerous expeditions were sent out against the American settlers on the frontier. It was captured by the British in the War of 1812, but was regained by the Americans the following year. The city was incorporated in 1824 and was for a time the capital of Michigan Territory and of the state. It was supplanted by Lansing in 1847. The city celebrated the 200th anniversary of its settlement in 1901. Population, 1910, 465,766; in 1920, 993,739, a gain of 113 per cent.

DETROIT RIVER, a river extending from Lake Saint Clair to Lake Erie, which, though only twenty-eight miles in length, is one of the most important waterways in the world. All the grain shipments from the Northwest and the ore transported eastward from the Lake Superior region passes through the Detroit River. It is from a half mile to three miles in width, and so is appropriately named, for *detroit* is French for *strait.* The river is studded with islands, and its scenery is very beautiful.

DEUCALION, *du ka'le on,* in classic mythology, the son of Prometheus. When, on account of the wickedness of mankind, Jupiter decided to destroy the world, Deucalion and Pyrrha, his wife, were spared because they had always been virtuous servants of the gods. When, after the deluge had subsided, Deucalion and Pyrrha came down from Mount Parnassus, they found the earth depopulated, and on seeking of the oracle at Delphi information as to how they could repeople the earth, they received the response that they were to throw behind them the bones of their mother. As this, literally translated, would have been to them a sacrilege, abhorrent to the gods, Deucalion and Pyrrha decided that the oracle referred to their mother earth. Accordingly they threw over their shoulders stones, which on striking the earth became human beings.

DEUTERONOMY, *du ter on'o mi,* the fifth book of the Bible and the last of the Pentateuch. It contains the last injunctions of Moses and an account of his death, and is practically a review of the law which was given to the Israelites on Sinai, with the additions that had been made from time to time until just before the death of Moses. The book consists of three orations, each of which deals with a specific phase of the law, and closes with an account of the death of Moses. It is notable for the beauty of its language and the comprehensive view of the Jewish law which it contains. It is supposed that a portion of this book was the book discovered during the reign of Josiah, and because of this it was known thereafter as the *Book of the Law.* A thorough understanding of it involves the reading of *Exodus, Leviticus* and *Numbers.*

DEV'IL, also called SATAN, an evil spirit; specifically, the evil one, represented in Scripture as the traducer and the father of lies. Most of the old religions of the East acknowledge a host of devils. In the doctrine of Zoroaster is an evil principle called Ahriman, opposed to the good principle and served by several orders of inferior spirits. The Mohammedan Eblis, or the devil, was an archangel whom God employed to destroy a pre-Adamite race of *jinns,* or genii, and who was so filled with pride at his victory that he refused to obey God. The Satan of the New Testament is also a rebel against God. He uses his intellect to entangle men in sin and to obtain power over them. He is a creature subject to omnipotent control, not an independent, self-existent principle, like the evil principle of Zoroaster.

The Scriptural idea of the Devil has become blended with the superstitions of various countries and with the mythology of the pagans. Ignorant hermits, unable to account for natural appearances, frequently have imagined Satan visibly present, and innumerable stories have been told of his attributes of horns, tail and cloven feet.

DEVIL FISH, the popular name of various fishes, one of them being the angler. In the United States and Canada the name is given to several large species of the ray, or skate, common on the Atlantic and Pacific coasts and much dreaded by divers. These fish are sometimes hunted by harpooners. On the Pacific coast the name is given to the California gray whale.

DEVILS LAKE, N. D., founded in 1882, is the county seat of Ramsey County, 100 miles nearly west of Grand Forks, on the Great Northern, the Soo Line and the Farmers' Grain & Shipping Company's railroads. The town is notable as the home of a large annual Chautauqua, and for the great number of lakes in the vicinity. There is a Federal building, a Carnegie Library, buildings erected by the Masons and the Elks, a state school for the deaf and a state biological station, an opera house, two hospitals and an academy. The city is interested extensively in milling, and it has Great Northern railroad shops. Population, 1920, 5,140.

DEVIL WORSHIP, the worship paid to a malignant deity believed in by many of the primitive tribes of Asia, Africa and America, under the assumption that this evil spirit will injure man unless bribed and propitiated. There is a sect called devil-worshippers inhabiting Turkish and Russian Armenia and the valley of the Tigris, who pay respect to the Devil, to Christ and to Allah, or the supreme being, and also worship the sun.

DEVO'NIAN PERIOD, a division of time in the history of the earth in what is known as the Paleozoic Era. It followed the Silurian period and was in turn followed by the Carboniferous. During this period that part of the globe's surface now known as North America was occupied by water and two land masses, the Appalachian and the

Continental. The first of these land masses extended as far south as Georgia and as far west as Blue Ridge Mountains, while the eastern boundary was probably farther east than the Atlantic shore line. The Continental mass extended westward from Hudson River, the shore line forming a great bay which covered the territory now occupied by western New York, Michigan and a part of Ontario. There were detached portions of land also in Colorado, in the region of the Black Hills, South Dakota, and in the central part of Texas. A long, narrow strip bordered what is now the great basin of Nevada and Utah. In the Old World most of Russia and Siberia were under water.

The animal life included crustaceans similar to the horseshoe crab and lobster. crinoids, starfishes and various forms of mollusks; but the most characteristic life of the period was that of the fishes, which then reached their highest development. This period has been by some geologists named the *Age of Fishes*. See Devonian System; Carboniferous Period.

DEVO′NIAN SYSTEM, in geology, a division intermediate between the Silurian and Carboniferous strata. It is characterized by sandstones of different colors, calcareous slates and limestones. All these contain fossils, including corals, crinoids, crustaceans, mollusca, cephalopods and fishes, the last predominating, having at this time reached their greatest development. Devonian rocks occupy a large area in central Europe as well as in the United States, eastern Canada and Nova Scotia. See Carboniferous Period.

DEVONSHIRE, *dev′on sheer,* Victor Christian William Cavendish, Ninth Duke of (1868–), a British statesman, the successor of the Duke of Connaught as Governor-General of Canada. He received a typical English education at Eton and Cambridge, entered the House of Commons as a Liberal-Unionist in 1891, and held his seat until 1908, when, having succeeded to the dukedom, he entered the House of Lords. He was a close friend of the royal family, holding the position of treasurer of the royal household under Queen Victoria and Edward VII. In 1903–1905 the duke served as financial secretary to the Treasury; in 1912 he was made a Privy Councilor, and in 1915 became civil lord of the Admiralty.

In 1916 he was appointed Governor-General of Canada, and in 1918 he visited the United States for the purpose of strengthening the bonds of friendship between the two allied nations in the World War. The duke is one of the largest landowners in England, possessing estates amounting to nearly 190,000 acres. These include both forest and mineral lands. He is a man of very attractive personality, a patron of art, literature and science, and a zealous sportsman.

DEW, moisture from the atmosphere that gathers on cool bodies, particularly at night. During the day the earth both absorbs and gives off heat, but after sunset its supply of warmth is cut off, while it still continues to radiate heat into the surrounding space. Grass, flowers and foliage, being good radiators, lose after sunset the heat which has previously been absorbed by them, without receiving any in return, and their temperature consequently falls considerably below that of the atmosphere. This lower temperature causes the condensation of the vapor in the atmosphere surrounding them, and it is deposited upon their surfaces in the form of dew, or of hoarfrost, where the temperature of the atmosphere is below 32°.

When the sky is clouded, the heat abstracted from the earth's surface by radiation is restored by the clouds, which, being good radiators, send back an amount of heat equal to what they receive; and a balance of temperature being thus maintained between the earth and the surrounding atmosphere, no dew is formed. The formation of dew is likewise prevented by wind, which carries away the particles of air before the vapor contained in them has been condensed. Horizontal surfaces and those which are exposed to a wide expanse of sky receive a greater supply of dew than sheltered or oblique faces, where circumstances di ish the amount of radiation.

The heavy dews which fall in tropical regions are in the highest degree beneficial to vegetation, which, but for this supply of moisture, would, in countries where scarcely any rain falls for months, be soon scorched and withered. But after the high temperature of the day, the ground radiates under these clear skies with great rapidity, the surface is quickly cooled, and the water vapor, which from the great daily evaporation, exists in large quantities in the atmosphere, is deposited abundantly. This deposition is more plentiful, also, on plants, from their greater radiating power; while on hard, bare ground and stones, where it is less needed, it is comparatively trifling. In cold climates the earth, being cold and sufficiently moist, requires little dew; accordingly, the clouds, which are common in damp and chilly regions, prevent the radiation of heat, and the deposition of dew is slight. See FROST.

DEWEY, GEORGE (1837–1917), an American admiral, conqueror of Spain in the Philippines in 1898 by the successful Battle of Manila Bay. Here he exemplified the preparedness and instant readiness of the United States navy for action in his famous order, "You may fire when ready, Gridley." Dewey was born in Montpelier, Vt., Dec. 26, 1837. He was graduated from the United States Naval Academy in 1858 and entered the service of the United States aboard the frigate *Wabash*. In 1861 he was commissioned lieutenant and assigned to the steam sloop *Mississippi*, under Farragut. He took part in forcing the defenses of New Orleans and later lost his vessel by running her aground in a fog. In 1870 he was put in command of the *Narragansett* and made surveys on the Pacific coast for six years, and some years later he was put in command of the *Juniata*, on the Atlantic station.

GEORGE DEWEY

Dewey next commanded the *Dolphin*, and later still the *Pensacola*, and in 1896 he was promoted to the rank of commodore. When war broke out with Spain, he was placed in command of the Asiatic squadron, and he won the Battle of Manila Bay, May 1, 1898, without the loss of a man from his fleet. For this he was made a rear admiral and was given the thanks of Congress. The next year he was created *admiral of the navy* by special act of Congress, the first to hold that highest rank, for former holders of admiral rank were only admirals. He returned to the United States in September and received an unprecedented popular welcome. A grateful nation through popular subscription presented him with a home in Washington. He was president of the naval board until a short time before his death.

DEWEY, JOHN (1859–), an American educator and psychologist, born at Burlington, Vermont. He was educated in the University of Vermont and filled successively the positions of professor of psychology in the University of Minnesota and the University of Michigan and professor of philosophy in the University of Chicago. He organized the laboratory, or practice, department of the School of Education at the last-named institution, and it is called for him the Dewey School. In 1904 he was chosen head of the department of philosophy in Columbia University. Professor Dewey has become widely known through his writings and lectures. The best known of his publications are *Psychology; The Critical Theory of Ethics; Study of Ethics; Psychology of Number, School and Society; Democracy and Education*, and *How to Think*.

DEWEY, MELVIL (1851–), an American librarian and educator, considered the leading authority on libraries in the United States. He originated the decimal system of classifying books, and was one of the prime movers in the work of university extension and in establishing traveling libraries. Dewey was born at Adams Center, N. Y., and educated at Amherst College. He early became interested in library work and was the leader in the movement to found the American Library Association. He was the founder, and for five years the editor, of the *Library Journal*. Later he was chosen librarian of Columbia University, where he established the School of Library Economy and became its director. From this position he was chosen secretary of the University of the State of New York and director of the state library. He transferred the library school to Albany, where it has since remained.

DEX'TRIN, a gummy substance made from starch by the action of dilute acids, by malt extract or by heat. By the action of hot diluted acid, dextrin is finally converted into grape sugar. It is white, insipid and without smell. It is a good substitute for gum arabic for stiffening goods and in calico printing, and is used also on the backs of postage stamps.

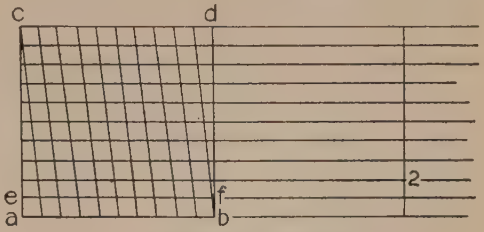
DI'ABASE, a variety of crystalline, igneous rock ordinarily composed of lime-soda, feldspar and pyroxene. The feldspar usually occurs in the form of long, flat crystals, distributed radially in groups. When the grains of pyroxene are large, a striking mottled effect is produced. Diabase sometimes contains olivine, and then is of a green color; again the pyroxene may be displaced by hornblende, and both the pyroxene and olivine by serpentine. Among the most important formations of diabase in the United States are the copper-bearing rocks of Keweenaw Peninsula, Lake Superior; the Palisades on the Hudson and the Hanging Hills near Meriden, Conn. Diabase also occurs in Scandinavia, Southern India, and elsewhere in smaller deposits. See BASALT; DIKE.

DIABETES, *di a be′teez,* a disease whose characteristic symptom is the presence of sugar in the urine. According to the latest theory on the subject, diabetes is the result of a diseased condition of the pancreas, frequently caused by overeating. The special work of this gland is the digestion of starches and sugars. When the pancreas does not function properly sugar accumulates in the blood and is carried off through the kidneys. Though diabetes is not a kidney disease, the demands made upon the kidneys irritates them, and the result is a great increase in the amount of urine passed each day. Other symptoms include intense thirst, dryness of the mouth and lips, loss of flesh and muscular weakness. With careful dieting the diabetic person may live for many years, but the disease is difficult to cure.

Treatment should be under the direction of a reliable physician, who will prescribe the proper diet. A recent method of treatment devised by a French physician has the patient fast until the urine is free from sugar. Foods containing starch and sugar are then introduced gradually, in proportion to the patient's ability to assimilate them, and frequent tests of the urine are made. Patients who undergo this treatment are watched carefully throughout the course.

DIACRITICAL, *di a krit′i kal,* **MARKS.** See ORTHOGRAPHY, subhead *Diacritical Marks.*

DIAG′ONAL SCALE, a scale which consists of a system of lines by means of which fractional parts of a unit of measurement may be determined. The scale is used in surveying and in map making. The accompanying illustration explains the use of the scale. The line from *a* to *b* represents one inch, that from *a* to *c* one inch. The square inch represented is divided by parallel lines into equal spaces, each representing one-hundredth part of a square inch. At the point where the line *bd* intersects the line *ef* may be measured one-hundredth part of a lineal inch. The two-hundredth part of a lineal inch is shown on the first horizontal line above *ef*.



DIAGONAL SCALE

DI′ALECT, forms of a language differing in grammar, vocabulary or pronunciation from the language as it has been adopted in literature and in intercourse among well-educated people. Although the use of provincial dialects becomes inconvenient after a language has acquired a fixed literary standard, the study of such dialects is always valuable to the philologist for the light it throws on the history of the language. Dialects at one time differed so in England that inhabitants of one county could scarcely understand those of an adjoining one, and there are many sections in which an American finds it difficult to understand what is being said. Dialect is employed frequently in fiction; the Scotch dialect stories of Scott, Ian Maclaren and Barrie form an important body of literature. French Creole, Yankee, Hoosier and negro dialects are characteristic American forms.

DI′AMOND, the hardest and one of the most valuable of gems, the purest form in which the element carbon is found. It crystallizes in forms belonging to the regular or, cubic, system, the most common being the regular octahedron and the rhombic dodecahedron (twelve faces). The finest diamonds are colorless, perfectly clear and transparent. Such are said to be of the first *water.* Some diamonds are blue, pink, green or yellow, and such are highly prized, if of a distinct and uniform tint throughout. The diamond is so very hard that nothing will scratch it; it is, in fact, the hardest substance known.

Diamond Cutting. The value of a diamond is much enhanced by the cutting of facets, or flat surfaces, upon it, inclined at certain angles to one another so as to produce the greatest possible play of light and color.

What is called the *brilliant* cut best brings out the beauty of a good stone—a central octagonal facet surrounded by many smaller facets. In what is called the rose cut, six triangular surfaces meet in the center.

The art of cutting and polishing the diamond was unknown in Europe till the fifteenth century, and the stone itself was not nearly so highly valued in the Middle Ages as the ruby. The uncut diamond looks like a piece of quartz. It is of a dull white color, and is full of rough seams. In this condition it is set into a matrix of wax, which is fastened to the end of a stick. In another matrix a cheap diamond is set, and a workman grinds the two stones together, until the one to be cut has assumed the general contour of the final cut. The dust and chips which come off are carefully collected and used afterward in polishing work. The rough stone is then firmly fixed in a stronger matrix made of zinc and lead. An iron disk turning at the rate of 2,000 revolutions a minute does the cutting. Upon the disk is sprinkled a supply of diamond dust, which sinks into the minute pores of the iron and produces the sharpest grindstone that can be made. The workman, with a magnifying glass close to his eyes, grinds first the table, or top part, of the stone. The metal matrix is then melted and the stone embedded, face downward, in another iron matrix for the grinding of the under side. After this, one by one, the facets, or bezils, are cut. If the diamond is large, the corners are also beveled.

Diamonds are valuable for many purposes. Their powder is the best for the lapidary. They are also used for jewels in watches, as lenses for microscopes, and in the cutting of window glass and plate glass. When used as a glazier's tool the diamond is not cut. Inferior kinds of diamonds are also extensively used by engineers in rock boring and by copperplate engravers as etching points.

Diamonds are obtained from alluvial deposits, such as sands and clays, from which they are separated by washing. They are found in India, Borneo and other parts of the East, and in some localities in North America and Australia; but the chief diamond fields of to-day are Brazil and Cape Colony, the center of the latter being Kimberley, in Griqualand West, where diamonds were discovered in 1867. The Kimberley mines now yield more than nine-tenths of all the diamonds produced in the world.

Historic Gems. One of the largest diamonds known (weight 367 carats) was found in Borneo about a century ago, and it now belongs to the rajah of Mattan. One of the most celebrated is the Koh-i-noor (Mountain of Light), belonging to the British crown. It weighed originally nearly 800 carats, but by subsequent recuttings it has been reduced to 103¾ carats. The Orloff diamond, which for a long time was the property of the czar of Russia, weighs 195 carats; the Pitt diamond, among the French crown jewels, weighs 136½ carats. The former, which came from India, has been thought to have originally formed part of the Koh-i-noor stone. Some of the South African diamonds are also very large. In 1905 the largest diamond yet discovered was found in the Premier mine in Transvaal Colony. It weighed in the rough about 3,000 carats, and was cut into nine large stones and a number of small ones. It was known as the Cullinan diamond.

DIAN'A, or **AR'TEMIS**, in classical mythology, the goddess of the moon and of the chase. She was the daughter of Jupiter and Latona and the twin sister of Apollo, and was born on the island of Delos. Diana was a maiden divinity, but that she was not en-

DIANA
From the Painting by Correggio.

tirely indifferent to the power of love is shown by her treatment of Endymion (which see). The strictest chastity was demanded of her worshipers, and at one time she changed Actaeon into a stag and allowed him to be torn to pieces by his dogs, because he had come upon her as she was bathing. As the goddess who presided over births, she was especially worshiped by women, and no man was allowed in her temple. In accordance with her various characters, there were differing representations of her. Most frequent are those as a huntress, with bow and arrows; as a moon goddess, with the crescent of the moon above her forehead, or as the goddess of the nymphs, in a chariot drawn by stags.

DIAPHRAGM, *di′a fram,* in anatomy, the large muscle that separates the cavity of the chest from that of the abdomen. The aorta, esophagus, thoracic duct, inferior vena cava and some of the large nerves pass through it. In its natural situation the diaphragm is convex on the upper side and concave on its lower, but when the lungs are filled with air it becomes almost flat, pressing the contents of the abdomen downward and outward. It is the principal agent in respiration, particularly in inspiration. A complete diaphragm is found only in mammalia, or animals that have milk glands. See HICCOUGH; RESPIRATION.

DIAS, *de′ as,* BARTHOLOMEW (?–1500), a celebrated Portuguese navigator. He was put in charge of an expedition to explore the west coast of Africa, and without knowing it he sailed around the southern end of the continent and found himself, to his surprise, on the east coast. The southernmost cape of the continent the Portuguese king named Cape of Good Hope (which see). On his return from a voyage to Brazil in 1500, Dias perished in a storm.

DI′ATOM, a microscopic plant, almost universally distributed throughout both salt and fresh water. They are found in rain troughs, in ditches, on sand at the bottom of clear brooks, on snow and even in the dust of volcanoes. Countless millions of them exist in the water, where they form a large part of the food of the lower marine animals. They exist in a great variety of beautiful forms, and have hard, prettily sculptured coverings, or shells.

DIAZ, *de′ahz,* PORFIRIO (1830–1915), the greatest figure in Mexican history for many years, a man sufficiently strong and wise to control the discordant elements of the republic. For a time he studied law, but at the outbreak of the war with the United States he entered the army, and from that time he devoted himself to a military career. In the factional fights which disturbed Mexico for many years he took a prominent part, identifying himself with the Liberal party and proving, during Napoleon III's attempt to found an empire under French control, a most efficient leader of the patriots. In 1867 he marched to Pueblo at the head of a Republican army and took the city by storm, and afterward he aided in the capture of the City of Mexico. In 1876 he became President, and he soon proved his exceptional ability. He was succeeded by General Gonzalez and became minister of public works, but in 1884 he was again elected President, and changes were made in the Constitution so that he might continue in office. Until 1911 the opposition to Diaz was not powerful enough to accomplish his overthrow, but in that year a revolution headed by General Madero resulted in the resignation of the President and his enforced departure from the country. He took up his residence in Paris, where he died.

PORFIRIO DIAZ

DICE, *dise,* cubical pieces of bone or ivory, marked on each of their six faces with dots, from one to six in number, and employed in gambling. In numbering the faces, the sum of the dots on opposite faces always equals 7. The dice are shaken in a small box and are then thrown on the table, when the spots showing uppermost are counted in various ways, usually like the cards in a poker hand. Dice are of very ancient origin, being well known among the Egyptians and Greeks.

DICKCIS′SEL, a handsome bird, rather larger than the majority of the sparrow family, to which it belongs, and common in the open regions of Central United States. Its back and body generally are dark, though there is a bright chestnut patch on the wing. Its throat is white; its lower parts are yellow, with a black crescent band across the breast. The name is an imitation of the bird's call.

DICK'ENS, CHARLES (1812–1870), one of the great English novelists of the Victorian Age, whose books were read in his own day more widely than those of any of his contemporaries. No other writer has ever equaled Dickens in ability to picture the life of the lower and middle classes of nineteenth-century England, and his novels are to-day read and enjoyed by a large following.

He was born at Landport, Portsmouth, and after a time removed to Chatham, where his rather shiftless father, the Micawber of *David Copperfield,* kept the family until 1821. After this the family went to London, where they fell into poverty, and Charles was for a time a mere drudge in a blacking warehouse. A period of schooling and a clerkship in a lawyer's office followed, and then, having mastered shorthand, he became a newspaper critic and reporter. Later he was a contributor to the *Monthly Magazine* and the *Evening Chronicle,* in which were published the essays and tales known as *Sketches by Boz.* These were so successful that a new series was begun, and in *Pickwick Papers* a new class of characters, eccentric, indeed, but vital representations of the humors and oddities of life, such as Mr. Pickwick, Sam Weller and his father, Mr. Winkle and others, were made familiar to the public.

CHARLES DICKENS

To *Bentley's Magazine* Dickens contributed *Oliver Twist,* a work which opened up that vein of satire of institutions which became a distinguishing feature of his work. As the special object of *Oliver Twist* was to expose the abuses of the workhouse system, so that of *Nicholas Nickleby* was to denounce the management of cheap boarding schools. Both did, indeed, do much toward correcting the abuses against which they were directed. *Master Humphrey's Clock,* issued in weekly numbers, contained among other matter the *Old Curiosity Shop* and *Barnaby Rudge,* the latter an historical tale. On his return from a visit to America, Dickens wrote *American Notes for General Circulation* and *Martin Chuzzlewit,* which dealt with his American experiences, and which contained more of his characteristic humor than any of his other works, except *Pickwick Papers.*

In 1845 Dickens went to Italy, and on his return the *Daily News* was entrusted to his editorial management; but this was an occupation uncongenial to his mind, and in a few months the experiment was given up. The *Pictures from Italy* were published the same year. Next followed *Dombey and Son* and *David Copperfield,* a work which has a strong autobiographical element, and which was Dickens's favorite among his works. In 1850 Dickens became editor of the weekly serial, *Household Words,* which was converted later into *All the Year Round.* In 1853 appeared *Bleak House,* an appeal against interminable suits in chancery, and this was followed by a *Child's History of England; Hard Times; Little Dorrit; A Tale of Two Cities,* the second of his novels with an historical setting; *Great Expectations,* the best-rounded of his works, and *Our Mutual Friend,* the last novel which he lived to finish. *The Mystery of Edwin Drood* was left incomplete at his death. During his latter years, Dickens increased his popularity by giving readings from his own writings.

In reading any of Dickens's novels, and more especially those that contain most of his peculiar wit and humor, one is impressed with the fact that he must have been a delightful companion. His humor lies so largely in the way he looked at things, the ability to put into words the incongruities which another observer might easily miss, that one feels that a walk about London with him would have afforded more amusement than the best passages of his works; and the testimony of Dickens's friends convinces us that he was in his everyday life the genial, interested man which one might expect to find him. He was of a very sociable temperament and delighted in having his friends about him. One of his most marked characteristics was the dramatic ability mentioned above and his extreme fondness for the theater. He often took part in private theatricals, and it is said that at one time an old banner-bearer at one of the theaters said to him, "Ah, Mr. Dickens, if it hadn't been for them books, what an actor you would have made!" This statement was not at all exaggerated.

The rank to which Dickens is entitled among novelists has been a question much debated. That his ability to grasp at once the most striking characteristics of a person, and his eagerness to make all men see as he saw, frequently led him into exaggeration, is true and gives ground to the charge that his characters are often caricatures. But his humor, his power of observation and his genuine love for men must be admitted, as must also the fact that many of his characters—Mr. Micawber, Sam Weller and Mrs. Gamp, for example—whether caricatures or not, fully justify their creation by the unfailing amusement which they afford.

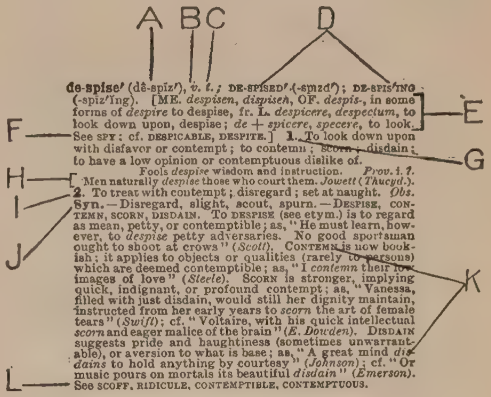
GADSHILL, DICKENS' HOME

Forster's Life of Dickens is an excellent biography of the author. The reader will find other points of interest in the article Biography, which contains a study of Dickens.

DICOTYLEDONS. See BOTANY; COTYLEDON.

DICTA'TOR, a magistrate of the Roman Republic. The holder of this office possessed extraordinary powers and was appointed only in times of great emergency. The power of naming a dictator was vested, by a resolution of the Senate, in one of the consuls. The dictatorship was limited to six months, and the person holding it could not go out of Italy or appear in Rome on horseback without the permission of the people. He had no control over the public funds without the permission of the Senate, but had the power of life and death and could punish without appeal to the Senate or people. All the other magistrates were under his orders.

DICTIONARY, *dik'shun a ri*, as ordinarily used, a term applied to a book containing the words, or a portion of the words, of a language, arranged in alphabetical order, with explanations and definitions. The importance of knowing how to use a dictionary should be impressed upon every boy and girl, for it is only through consulting such a book that one's vocabulary is enlarged and the correct meanings of words is learned. The average pupil in the grades uses perhaps two or three hundred words, and his parents not more than 2,000, while at their disposal is a rich storehouse of thousands of words, a knowledge of which would give a splendid command of English. There are simple, easily-understood dictionaries for children in the lower grades, and these should be found in every home and school library. For the adults and older boys and girls a complete standard dictionary is the most desirable, for such dictionaries give a vast amount of valuable information. As is shown in the illustration given below, in a complete dictionary one finds many other facts besides the definition of a word: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de-spise' (dē-spīz'), *v. t.*; DE-SPISED' (-spīzd'); DE-SPIS'ING (-spīz'ĭng). [ME. *despisen*, *dispisen*, OF. *despis-*, in some forms of *despire* to despise, fr. L. *despicere*, *despectum*, to look down upon, despise; *de* + *spicere*, *specere*, to look. See SPY: cf. DESPICABLE, DESPITE.] **1.** To look down upon with disfavor or contempt; to contemn; scorn; disdain; to have a low opinion or contemptuous dislike of.

Fools *despise* wisdom and instruction. *Prov. i. 7.*
Men naturally *despise* those who court them. *Jowett (Thucyd.).*

2. To treat with contempt; disregard; set at naught. *Obs.*

Syn.—Disregard, slight, scout, spurn.—DESPISE, CONTEMN, SCORN, DISDAIN. To DESPISE (see etym.) is to regard as mean, petty, or contemptible; as, "He must learn, however, to *despise* petty adversaries. No good sportsman ought to shoot at crows" (*Scott*). CONTEMN is now bookish; it applies to objects or qualities (rarely to persons) which are deemed contemptible; as, "I *contemn* their low images of love" (*Steele*). SCORN is stronger, implying quick, indignant, or profound contempt; as, "Vanessa, filled with just disdain, would still her dignity maintain, instructed from her early years to *scorn* the art of female tears" (*Swift*); cf. "Voltaire, with his quick intellectual *scorn* and eager malice of the brain" (*E. Dowden*). DISDAIN suggests pride and haughtiness (sometimes unwarrantable), or aversion to what is base; as, "A great mind *disdains* to hold anything by courtesy" (*Johnson*); cf. "Or music pours on mortals its beautiful *disdain*" (*Emerson*). See SCOFF, RIDICULE, CONTEMPTIBLE, CONTEMPTUOUS.

WHAT MAY BE FOUND IN A DICTIONARY

A. The pronunciation of a word is given. By means of footnotes on the page the reader is aided in understanding the pronunciation marks.

B. The part of speech is given.

C. When the word is a verb, the dictionary states whether it is transitive or intransitive.

D. The principal parts are given in case of verbs.

E. The derivation of the word is given; that is, the languages and the words from which it comes.

F. Reference is made to other words related to it in meaning.

G. The modern meanings of the word are given.

H. Sometimes quotations are added to show how the word is used in standard writings.

I. Other meanings no longer in good use are listed. The abbreviation Obs. stands for obsolete, which means out of date.

J. A list of synonyms, or words that have much the same or the same meaning, is given.

K. The shades of difference between these words are made clear by explanations and illustrations.

L. Reference is made to other words. By looking up these the reader will find further information relating to the word in question.

The first attempt to give a complete list of the words of the English language was made by Nathan Bailey (1721) in his *Universal Etymological English Dictionary.* The famous dictionary of Doctor Johnson, published in 1755, marked an epoch in the history of the English language. By this, too, was introduced the practice of illustrating the use of words by quotations from the best authors. The first great American dictionary was published in 1828 by Noah Webster. This work has been frequently republished, and in subsequent editions has almost entirely altered its character. It is now known as *The International Dictionary* and is the standard authority in most of the states. The large American dictionary by Doctor Worcester has also made a good position for itself. Among other modern dictionaries of the English language, the most important are *The Standard Dictionary* and *The Century Dictionary.*

DICTOGRAPH, *dik′toh graf,* an instrument constructed on the same principle as the telephone, but differing from that apparatus in many respects. The transmitter placed in any part of a room will convey any conversation carried on there—even loud whispers. This instrument is often used in detective cases, being concealed in places where disclosing conversations are expected to take place. The person wishing to hear what is said listens at the other end of the wires through a receiver which greatly increases the volume of sound.

DIDACTIC, *di dak′tik,* **POETRY**, poetry intended to teach, to give definite instruction on a subject or range of subjects. Thus the *Georgics* of Vergil and the *De Rerum Natura* of Lucretius profess to give, the one a complete account of agriculture and kindred arts, the other a philosophical explanation of the world. In a larger sense of the word, most great poems might be called didactic, since though without obvious aim at instruction, they contain history or moral teaching. Also, Milton's *Paradise Lost, Goethe's Faust* and the dramas of Shakespeare all have ethical lessons, which are not, however, the sole, or even the chief, object of these works.

DI′DO, daughter of a king of Tyre. After her father's death, his successor, Dido's brother Pygmalion, murdered her husband, Acerbas, or, as Vergil calls him, Sichaeus, for his wealth. Dido, however, managed to conceal this wealth, and to escape with it to Africa, taking with her also many of the inhabitants of Tyre. Having obtained from the people of northern Africa a promise of as much land as she could cover with a bull's hide, she resorted to stratagem, cut the bull's hide into narrow strips, which she fastened together, and with this rope enclosed a large piece of land, on which was built the citadel at Carthage. Vergil tells that Aeneas in his wanderings landed at Carthage and was entertained by Dido, who fell in love with him. When he was directed by the gods to depart, Dido in despair killed herself. (See illustration, page 30.)

DIE, a tool used for stamping metal. The die is made of the finest steel, and the design which it is to stamp is engraved upon it. Dies are used in stamping tools, coins and metals. They can be used by hand, but those used for stamping coins and medals are worked by machinery. In stamping coin, two dies are used, one above and one below, so that both faces are stamped at once.

DIELEC′TRIC, in general, an insulator or nonconductor of electricity. The term is especially applied to a nonconductor separating two conductors. See INSULATOR.

DIE-SINK′ING, the art of preparing dies for stamping coins, buttons, medallions, jewelry and fittings. The steel for the manufacture of dies is carefully selected, forged at a high heat into the rough dies, softened by careful annealing and then handed over to the engraver. After the engraver has worked out the design in intaglio the die is put through the operation of hardening, after which, being cleaned and polished, it is called a *matrix.* This is not, however, generally employed in multiplying impressions, but is used for making a *punch,* or steel impression for relief. For this purpose another block of steel of the same quality is selected, and after being carefully annealed or softened, it is compressed by proper machinery upon the matrix, till it receives the impression. When this process is complete, the impression is retouched by the engraver and is hardened and collared like the matrix. Any number of dies may now be made from this punch, by impressing upon it plugs of soft steel. In place of this process, patterns are now frequently engraved upon rollers, for transference to sheet metal by pressure.

DI′ET, in Europe, a name given to a meeting which in America would be called a congress, conference or assembly. Diets have been held on numerous occasions to settle religious controversies; a particular instance was the Diet of Worms (1521) which ordered Luther to appear before it (see LUTHER, MARTIN). In some European countries the legislative body is known as the diet.

DIET, the food which is habitually eaten and drunk, to repair the waste of tissues and to support growth. The diet of persons varies much according to climate, work, age, sex, strength, state of health and individual taste. A man of average weight and in normal health would require for a well-balanced diet about the following amount of food a day; proteins, four ounces; fats, three ounces; sugars and starch (carbohydrates), fourteen ounces; water, four quarts.

Slight changes are necessary for a change in climate. Hard work makes necessary an increase in all articles of diet. A diet composed largely of proteids will increase flesh. A diet of easily digested food is necessary for brain workers. The diet of a child should be different from that of a person in middle life, and that of an aged person is different from either, though it may be more nearly like that of a young child, for as activity diminishes the quantity of food should be decreased. Particular diets are necessary in certain diseases, and when a person follows a prescribed course in eating he is said to be "on a diet." In tuberculosis a person must eat all that he can digest of nitrogenous foods, bread with much butter, fats, olive oil, milk, cream, meats and eggs. Skim milk is valuable in diseases of the digestive organs. See FOOD; DIGESTION.

DIFFRACTION, *dif frak′shun*, in physics, the spreading of rays of light, so as to form a spectrum (see LIGHT, subhead *Spectrum*). If a small round hole is made in a shutter to a dark room, and the rays of light thus admitted are allowed to fall upon a screen, an image of the sun surrounded by rainbow hues is observed. If the hole is changed to a slit, a similar effect is produced. By coating a pane of glass with India ink, and then with a fine needle ruling parallel lines upon this surface, as near together as possible, a *diffraction screen* is produced, which will illustrate most of the phenomena of diffraction. Glass screens with very fine rulings are prepared by the most delicate machinery, for the purpose of illustrating the phenomena in physical laboratories. The play of colors seen on the feathers of some birds and in mother-of-pearl is due to diffraction.

DIFFU′SION, the natural mixing of two fluids, either gaseous or liquid, when brought in contact. To demonstrate, fill a glass jar with water that has been slightly colored with litmus; then with a small tube place a few drops of sulphuric acid in the bottom of the jar. Watch the color of the water change. As fast as the acid comes in contact with the litmus solution, it changes the blue to red. If the vessel is allowed to remain quiet, the line of red slowly rises, until the blue disappears entirely, showing that the acid has entirely permeated the water. The contents of the jar becomes a weak acid. Alcohol and water placed in a vessel will mix in a similar manner, but such liquids as oil and water or water and mercury will not mix. Gases diffuse in a similar manner. If two jars be placed with their mouths together, the lower filled with chlorine and the upper with hydrogen, though hydrogen is much the lighter, the contents of both jars will in a short time be the same.

DIGESTION, *di jes′chun*, the process whereby food is prepared for absorption by the blood. Digestion begins in the mouth, where the saliva dissolves the salts and sugars taken in a solid form, and by its active principle, ptyalin, changes starch into sugar. In the stomach the salivary digestion may continue for some time, or till the presence of the free acid there stops the action of the ptyalin. The food, subjected in the stomach to a slight churning process, is mixed with the gastric juice, the active principle of which is pepsin. It digests albumens, changing them into soluble peptones. It does not affect the starches that have escaped the action of the ptyalin, the sugars or the fats. Milk is curdled by the acid of gastric juice and by a ferment called *rennin.* The average time occupied in the digestion in the stomach is from three to four hours, but this varies according to the quantity and quality of the food, muscular exertion, bodily health and the condition of one's mind.

When the *chyme,* the partly digested food, passes through the pylorus into the small intestine, the last stage of digestion begins (see INTESTINE). The pancreatic juice through its ferment, *trypsin,* finishes the work of the gastric juice in converting proteids into peptones. It completes the work of the saliva in converting starch into sugar, and the bile changes the fats and oils into a soapy substance. The intestinal juices complete the work, and *chyle,* the digested food, is ready for absorption. In the large intestine there is but little digestion carried on. See Absorption; Chyle; Food; Saliva.

DIGIT, *dij′it,* in arithmetic, any one of the ten numerals, which are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. It is also a measure of a finger's breadth, equal to about three-quarters of an inch. Digit in anatomy is any one of the fingers or toes. In astronomy it is a unit of measure equal to one-twelfth the diameter of the sun or moon and used in estimating the quantity of an eclipse; that is, if the eclipse obscures one-half the diameter of the planet it is an eclipse of six digits.

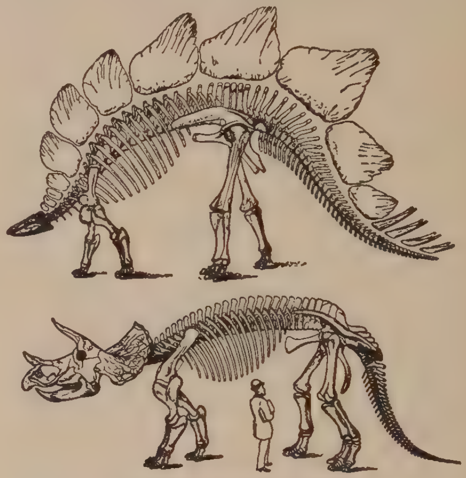
DIGITALIS, *dij i ta′lis.* See Foxglove.

DIKE, an igneous rock, which in the molten state flowed into a fissure, where it solidified. Dikes are found in all regions that have been subjected to volcanic action. They vary from a few inches to a hundred feet or more in thickness. The rock in thin dikes is usually more compact, because of the quick cooling. The surrounding rocks may be sedimentary or igneous, and usually are of a different degree of hardness. Dikes should be distinguished from veins containing ore deposits.

Artificial embankments designed to prevent overflows are also called dikes. Holland is thus protected from the North Sea, and in other places river valleys are reclaimed by this means.

DILLON, John (1851–   ), an Irish politician, the chairman of the Irish Nationalist party from 1896 to 1899, and successor of John Redmond in that position after the latter's death in 1918. Dillon was elected to Parliament for Tipperary in 1880, and open expression of radical views led to his imprisonment for several years. In 1885 he was elected to Parliament for East Mayo, and was regularly reëlected until 1918. During the critical period in 1918, when the Irish question became acute, he firmly opposed conscription in Ireland, but also opposed the radicals of the Sinn Fein Movement (see Sinn Fein). In the election of December, 1918, the Irish Nationalist party was practically wiped out, and Dillon lost his seat to a Sinn Feiner.

DIME, a silver coin of the United States, stamped to pass for ten cents in value. As a matter of fact, there is only about five cents' worth of silver in the dime, at the usual value of silver (see Alloy). Dimes are legal tender (which see) for the payment of a debt not exceeding ten dollars. The word is of French and Latin derivation and means *tenth;* thus its name, applied to the tenth part of a dollar.



FOSSIL DINOSAURIA

DIM′ITY, a thin cotton fabric, usually white, resembling muslin, but with ornamental stripes or figures in "self-color" woven into it.

DING′LEY BILL, a tariff measure passed in the United States Congress in 1897, notable as a high-protection measure (see Protection; Tariff). It bore the name of Nelson Dingley (1832–1899) as author, because Dingley, a Representative from Maine, was chairman of the House Ways and Means Committee and in charge of the bill while it was being compiled and passed.

DINGO, *ding′go,* the native wild dog of Australia, extremely fierce and of a wolf-like appearance. The ears are short and erect, the tail is rather bushy and the hair is of a tawny color. This is the only kind of dog in existence which is found in both a wild and domestic state. The natural cry of the dingo is a wolfish howl. When kept with the dogs the animal learns to bark. It is very destructive to sheep and small domestic animals.

DINOSAURIA, *din o saw′ri a,* large prehistoric reptiles, the remains of which are found in certain rocks. They were intermediate between the ostrichlike birds and the lizards. The megalosaurus, one of the largest species, when full-grown, was forty feet long. It fed upon flesh. The *iguanodon,* about half as long, fed upon vegetable food. The *diplodocus* was of medium size. In all these species the small heads indicated the animal's slight brain development and consequent low order of intelligence. See Iguanodon.

DIN′WIDDIE, Robert (1690–1770), a colonial official in America, born in Scotland. He was governor of Virginia from 1752 to 1758, but was recalled, after precipitating the French and Indian War and, by his ill temper, avarice and incompetence, rendering himself generally unbearable to the Americans.

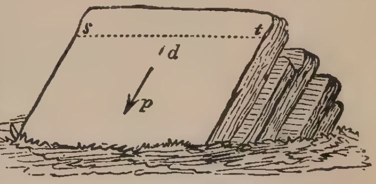
DIOCLETIAN, *di o kle′shun,* emperor of Rome, a man of low birth, who was raised to the imperial power by the army in A. D. 284. He appointed Maximian as his colleague, and chose two assistants, known as Caesars, who were to receive the succession. Under these four the Romans won numerous victories. Diocletian and Maximian resigned the power to their subordinates in 305.

DIOGENES, *di oj′e neez* (412–323 B. C.), a famous Athenian philosopher, the most distinguished representative of the Cynic School. He despised all philosophical speculations and exposed the follies of his contemporaries with wit and good humor. He opposed the corrupt morals of his time, and advocated the simple life. As an exemplar of Cynic virtue he ate the coarsest food, practiced the most rigid temperance, walked through the streets of Athens bearded, with feet bare, without any coat, a stick in his hand and a wallet on his shoulders, and, according to the popular story, slept in a tub. According to another story he went about the streets of Athens by daylight with a lantern in his hand looking, as he said, for an honest man. To Alexander the Great, who asked "How can I serve you, Diogenes," he made the famous reply, "By standing out of my sunshine." "If I were not Alexander, I should wish to be Diogenes," was the ruler's comment. See Cynic School of Philosophy.

DIOMEDES, *dio mee′deez,* in Greek mythology, a king in Thrace who had a number of mares, which he fed on human flesh. All strangers who entered his territory were thrown to these animals to be devoured, until Hercules, overcoming Diomedes, fed him to the horses, which he afterward carried off. A second Diomedes was one of the heroes at the siege of Troy, chiefly noted for having helped Ulysses carry off the Palladium.

DIONYSIUS, *di o nish′i us,* **THE ELDER** (431 ?–367 B. C.), tyrant or absolute ruler of ancient Syracuse, a man of obscure parentage. He served in the army, obtained the rank of general and afterward of commander in chief and, gaining the support of the army, seized the supreme power in Syracuse when he was but twenty-five years of age. He extended his rule over other cities in Sicily, and also gained a complete victory over the Carthaginians living on the island. As a patron of art and learning he made Syracuse a brilliant center of Grecian civilization. Dionysius the Younger, his son, figures in the story of Damon and Pythias (which see).

DIP, in geology, the name given to the angle of slope of inclined rock strata, as *dip* in the diagram. The dip is measured in degrees and is determined by a simple instrument called the clinometer, a square slab of wood having on one of its broad flat surfaces a graduated arc, across which hangs a plummet, attached to one corner. When the block is placed against the rock in such a way that the surface on which the arc is drawn stands at right angles with the rock, and so that the plummet suspended from the highest corner of the block swings across the face of the arc, the angle of the dip is determined. The horizontal direction at right angles to the line of dip is called the *strike,* shown by *st* in the diagram.



DIP

DIPHTHERIA, *dif the′re ah,* or *dip the′re ah,* an infectious and exceedingly dangerous disease, which usually attacks the young in preference to the old. It is caused by a bacillus which has been identified, and the mode of infection is well understood (see Germ Theory of Disease).

In diptheria the throat is inflamed, and a false membrane forms. This appears first in patches on the mucous membrane of the tonsils, and it then extends to the larynx and up into the nasal passages and the mouth. If it goes down into the esophagus it may cause suffocation by closing the tube to air. Diphtheria causes great weakness and nervousness and is frequently accompanied by other diseases, and paralysis may follow at any time within a few weeks after the attack. Within recent years serious epidemics have been prevented by the isolation of patients, and the severity of attacks has been lessened wonderfully by early inoculation with an antitoxin prepared for that especial purpose (see SERUM THERAPY). If the antitoxin is administered in time, it is almost as certain a specific as vaccination is for smallpox. Therefore parents should lose no time in consulting a physician as soon as their children show a diseased condition of the throat, or a tendency towards it.

Because of the highly-contagious character of this disease, very strict precautions should be taken during the course of an attack. Not only should the patient be kept isolated, but the bedding and everything else in the sick room should be thoroughly disinfected. After recovery the house must be completely fumigated. In case of suspected exposure, those liable to contract the disease should be inoculated.

DIPHTHONG, *dif′thong,* or *dip′thong,* a coalition or union of two vowels in one syllable. In uttering a proper diphthong both vowels are pronounced, but the two sounds are so blended as to form one syllable, as in *void, bough.* The term *improper diphthong* is applied to the union in one syllable of two or more vowels, of which only one is sounded, as in *bean.*

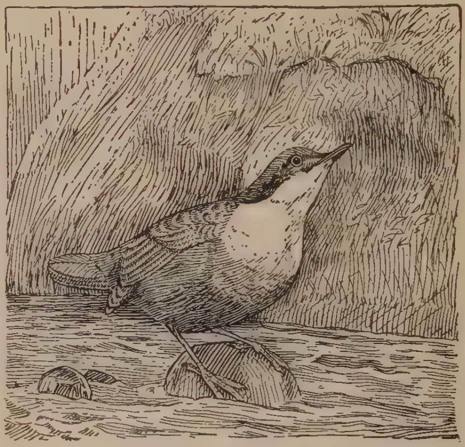
DIPLO′MACY, the science or art of conducting political negotiations between nations; the branch of knowledge which deals with the relations of independent States to one another; the agency or management of envoys accredited to a foreign court; the forms of international negotiations. Cardinal Richelieu is generally considered as the founder of that regular and uninterrupted intercourse between governments which exists at present among almost all the Christian powers.

Diplomatic agents are of several degrees: 1, ambassadors; 2, envoys extraordinary and ministers plenipotentiary; 3, ministers resident; 4, *charges d'affaires.* Besides these, each legation has its secretary and military and naval *attaches.* The four grades of representatives in the diplomatic service are discussed under their titles in these volumes.

Related Articles. Consult the following titles for additional information:

Ambassador	Envoy Extraordinary
Charge d' Affaires	Minister Resident

DIP′PER, or **WATER OUZEL,** a remarkable little singing bird, closely related to the thrushes, but resembling the wrens in appearance, especially in its up-tilted tail. It is covered with very close, water-proof plumage and lives about streams, often in the vicinity of waterfalls, into which it dashes in a perfectly fearless manner. At times it goes entirely through a cascade and finds in the crevices of the rocks back of the water, dry places where it can build its dome-shaped nests and rear its young. The dipper is a rather dark bird with a white breast, and as it moves about it jerks its tail upward and bobs its head downward. There are several species of dippers found in Asia, northern Europe and the high regions in the western parts of the United States and Canada.



EUROPEAN DIPPER

DIPPING NEEDLE, a magnetic needle mounted on a horizontal support, and free to move in a vertical plane. The dipping needle is used to test the force of the earth's magnetism at different places on its surface. At the magnetic equator the needle maintains a horizontal position. Moved north, the north pole of the needle dips downward; moved south, the south pole dips, the degree of declination indicating the strength of the magnetism. At the magnetic poles the dipping needle assumes a vertical position.

DIPSOMA′NIA, a species of insanity, in which the patient has at times an ungovernable craving for liquor, which he indulges without restraint. On all other subjects the dipsomaniac may be wholly sound, and between the attacks of his mania he may be an irreproachable person, with a marked aversion to alcohol in any form. Few victims of this malady recover. The disorder often terminates in imbecility.

DIP′TERA. See INSECTS.

DIRECTORY, the executive body of five men appointed to direct the government of France in 1795. According to the constitution, one member of the Directory was to retire each year to make way for a new member. Its dealings with internal affairs made the body unpopular, and its military policy led to its complete overthrow by Napoleon in 1799. It was succeeded by the Consulate. See Napoleon I.

DISCIPLES OF CHRIST, or **CHRISTIANS**, a Protestant denomination representing the fruit of the labors of Thomas Campbell and his son Alexander (see CAMPBELL, ALEXANDER). In 1812 the two Campbells, who were living in Virginia, left the Presbyterian Church and began to work for a simpler form of organization and worship. At first they associated themselves with the Baptists, but later their followers separated into distinct bodies, and the movement took definite form about 1830, when Alexander Campbell began the publication of the *Millennial Harbinger*, in which he set forth the principles of his faith.

DIPPING NEEDLE

The Disciples of Christ accept the Bible as the only revelation of Divine will, and they have no authoritative creed. So far as possible they pattern their forms of worship after those of the apostolic church, and they practice baptism by immersion and the weekly observance of the Lord's Supper. In the United States they are most numerous in the central and western sections. Throughout the country they have over 8,000 churches and more than 1,300,000 communicants. They also are well represented in Great Britain, Canada and Australia.

DISCOBOLUS, *dis kob′o lus*, THE, a famous statue representing a Greek athlete throwing the discus. It was made in bronze by the Athenian sculptor Myron, in the fifth century B. C. The statue has been many times reproduced, one of the finest copies being that in the Vatican, Rome, which is of marble. (See DISCUS, THROWING THE).

DIS′COUNT, a reduction from a stated sum or price. In trade a discount is allowed from list prices because values have fluctuated, or for payment of an account before it is due; such deduction or allowance is called *trade discount.* If a bank buys a note of you or if you borrow money from it, the bank takes its interest in advance and gives you the *proceeds.* You may request a loan of $100, for four months, at 6 per cent. The interest is $2; the bank gives you $98 as proceeds, and takes your note for $100, without interest, if paid when due. This discount is called *bank* discount.

Another method of discount, called *true* discount, is no longer employed.

DIS′CUS, THROWING THE, an athletic exercise which was in high favor among the ancient Greeks, and which is still popular among athletes. The ancient discus was a round plate of stone or metal, twelve inches in diameter and of four pounds seven ounces weight. The modern discus is made of wood and is bound on the edge with a steel band. It is eight inches in diameter and two inches thick at the center, and weighs four and a half pounds.

The discus thrower stands in a seven-foot circle, holds the discus flat against the palm of his hand and after a preliminary swing of his body hurls it without leaving the circle in which he stands. The trained athlete easily throws 140 feet. Discus throwing demands less muscular strain than shot-putting and throwing the heavy weight, proficiency depending on skill rather than on great strength.

DISEASE, *diz eez′*, ill health not caused by old age. Diseases are frequently classified as *functional* and *organic*. In the former the organs are sound, but from some cause do not work properly; in the latter, the tissues of the organs are not healthy. Measles and scarlet fever are examples of functional diseases; cancer of the stomach and Bright's disease are organic. Sometimes both forms are present together. The most important diseases arise from the presence in the organs of bacteria and of poisonous products formed by foreign substances.

Related Articles. Consult the following titles for additional information:

Abscess
Adenoids
Anaemia
Angina Pectoris
Aphasia
Apoplexy
Appendicitis
Asphyxiation
Asthma
Astigmatism
Atrophy
Bacteria and Bacteriology
Baldness
Blindness
Boil
Bright's Disease
Bronchitis
Bunion
Burns and Scalds
Cancer
Canker
Catalepsy
Cataract
Chicken-Pox
Chilblain
Cholera
Colic
Corns
Cough
Croup
Dandruff
Delirium
Delirium Tremens
Diabetes
Diphtheria
Dropsy
Dyspepsia
Eczema
Elephantiasis
Epidemic
Epilepsy
Erysipelas
Fainting
Fever
Frostbite
Gangrene
Gastritis
Goiter
Gout
Hay Fever
Headache
Hernia
Hiccough
Hives
Hookworm
Hydrophobia
Hysteria
Immunity
Infantile Paralysis
Infant Mortality
Influenza
Insanity
Insomnia
Itch
Jaundice
Kleptomania
Laryngitis
Lead Poisoning
Leprosy
Lockjaw
Locomotor Ataxia
Lumbago
Lunacy
Lupus
Malaria
Measles
Medicine (with list)
Meningitis
Monomania
Mumps
Myopia
Nausea
Nephritis
Neuralgia
Neurasthenia
Neuritis
Neurosis
Neurotic
Nightmare
Palpitation of the Heart
Paralysis
Pellagra
Peritonitis
Plague
Pleurisy
Pneumonia
Putrefaction
Quinsy
Rheumatism
Rickets
Ringworm
Saint Vitus's Dance
Scarlet Fever
Scrofula
Scurvy
Seasickness
Sleeping Sickness
Smallpox
Spasm
Squinting
Sunstroke
Tic Douloureux
Tonsilitis
Trichiniasis
Tuberculosis
Tumor
Typhoid Fever
Typhus Fever
Varicose Veins
Vertigo
Vomiting
Whooping Cough
Wounds
Yellow Fever

DISEASE, GERM THEORY OF. See GERM THEORY OF DISEASE.

DISEASES OF PLANTS. A knowledge of plant diseases is of the greatest importance to the farmer. It is estimated that losses amounting to millions of dollars result every year from certain plant diseases. They are generally due to one of the following four causes: fungi, bacteria, insects or physiological causes.

There are fungi which live wholly within the tissues of the plant, those that throw their spores in the air and those that live in the open air, fastening their rootlets to the plant and penetrating openings in the epidermis. When once the plant is attacked, the diseases progress with great rapidity. Familiar examples of diseases by fungi are rusts and smuts of corn, potato rot and mildews (see RUST; GALLS; MILDEWS).

In bacterial diseases insects visiting the plant introduce into the cells bacteria, which, when once they have gained entrance, seem to be beyond control of remedy and cause the injury or death of the plant without delay. It is impossible to cure plants when once infected by bacteria, but it is possible to prevent the spread of the disease to the other plants, by utterly destroying those which are diseased. The chief examples of these diseases are fire blight of apples and pears, black rot of cabbage, and celery disease, tomato disease and sweet corn disease.

Certain insects, such as the eelworms or the phylloxera, attack various plants. The phylloxera attack grapes and have been very injurious to whole vineyards in Europe. Orange trees, roses and cucumber plants are also subject to the attacks of these worms. It is said that lime is a good remedy, and in greenhouses it is possible to free the soil from infection by baking or freezing it.

The physiological diseases are generally caused by unsanitary conditions, such as improper soil or lack or excess of light or water. The leaves generally turn yellow and drop, and the whole plant assumes an unhealthy appearance.

Prevention of plant diseases requires careful study. If the seed is suspected, it should be treated before planting with some solution which will kill the spores. Fields in which the disease has appeared should have the old stubble burned over and be cleared of all shrubbery and other objects in which the spores may find refuge, before plowing for the second crop. Even with these precautions it is wise to plant the field the second season with a different sort of grain, selecting something upon which these spores cannot feed.

DISINFECT'ANTS, a term derived from the Latin for *without infection*. It is applied to those substances which have the power of destroying disease germs. Disinfectants are widely used for sterilizing surgical instruments and other equipment used in operations, and for disinfecting the furnishings of rooms in which patients with infectious diseases have been nursed. Among the important substances so used are chloride of lime, carbolic acid, cresol, formaldehyde and iodine. See ANTISEPTIC.

DISPEN'SARY, a place where free medicines or free prescriptions are given to poor patients who are able to apply in person for them. In nearly all large cities such places are supported by private funds or as a regular branch of public benefaction. Though sometimes dispensary privileges are abused by the well-to-do, these institutions are of such benefit to the poor that they deserve to be a permanent form of social service.

DISPENSA'TION, a license or special privilege granted by an authorized Church official to a person who desires to be excused from complying with some Church rule. In the Roman Catholic Church, for example, parish priests have the right to *dispense* their parishioners from observing fasting or holy days, but in matters of highest importance the power of dispensation rests with the Pope or other high dignitaries. In the Church of England the Archbishop of Canterbury may grant special licenses for the performance of the marriage ceremony without the publishing of banns, while the bishops are empowered to give clergymen special permission to hold more than one charge or to work outside of their parishes.

In fraternal organizations dispensation is the permission granted by the highest authority to subordinate lodges to perform some act not provided for in the regular rules or routine.

DISRAELI, *diz ra'li*, BENJAMIN, Earl of Beaconsfield (1804–1881), an eminent English statesman and writer. He was the eldest son of Isaac Disraeli, a man of letters, who with his family in 1817 renounced Judaism and joined the Church of England. Benjamin studied law, but finding it distasteful, turned to literature, and in 1826 brought out a novel, *Vivian Grey*, a marked success. In the ten years following, Disraeli traveled in Europe, wrote intermittently and became interested in politics. In 1837 he was elected to Parliament as a Tory member from Maidstone. During his first years in Parliament he supported Peel, but when Peel gave his support to the repeal of the Corn Laws, Disraeli withdrew from his party and soon became recognized in the House as leader of the protectionists. Some years later, feeling that the people did not wish longer a protection policy, he abandoned it. He was made Chancellor of the Exchequer in 1852 and three times subsequently he served in the same office.

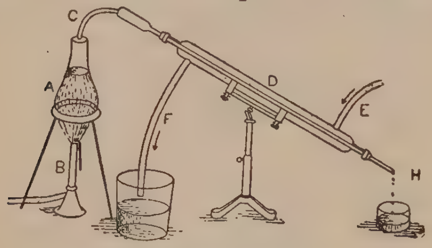
BENJAMIN DISRAELI

In 1868 Disraeli became Prime Minister, but his party was defeated at the next election, and not until 1874 did he again come into power. This time, however, he had come in with a strong Conservative majority, and he remained in power for six years. Disraeli as Prime Minister introduced many reforms, but his administration was chiefly noteworthy for its foreign policy. The gaining control of the Suez Canal, the proclaiming of Victoria as Empress of India and the compelling of Russia by the Treaty of Berlin to abandon a part of its ambitious plans against Turkey were the most important events of his ministry. During his term as Prime Minister, too, Disraeli entered the House of Lords as Earl of Beaconsfield. His party was defeated in 1880, and Disraeli withdrew into private life.

His novels, most noteworthy among which are *Henrietta Temple, Coningsby, Tancred, Sibyl* and *Lothair*, are of great interest, because they deal, from the point of view of an insider, with fashionable social life of the time.

DISTEM'PER, an animal disease caused by a germ producing catarrhal inflammation. The lungs, nose, eyes or nervous system may be attacked, and the initial symptoms include trembling, chills, weakness and failing appetite. As an attack progresses it is characterized by inflammation and watering of the eyes, sneezing, coughing, restlessness and loss of flesh. Distemper attacks various domestic animals, but especially young dogs. Treatment consists in keeping the sick animal in a clean, warm place and giving it nourishing broth. Inflamed eyes should be washed with boric solution or a one per cent solution of carbolic acid. A reliable remedy for coughing is compound licorice powder. Doses consisting of two grains may be given two or three times daily.

DISTILLATION, *dis til a'shun*, a process of boiling liquid, such as water, and condensing the vapor thus formed. The object of distillation is to separate the liquid from the impurities contained in it. The illustration shows a distilling apparatus. Water to be distilled is placed in the reservoir marked *A*. Beneath this is the light for heating. The steam passes through the connecting tube *C* into tube *D*, which is enclosed in a larger tube supplied with cold water from the pipe *E*. As soon as the steam reaches *D*, which is kept cool with the surrounding cold water, it condenses, or becomes liquid again, and discharges into the cup marked *H*. The running water which cools the tube *D* discharges through the pipe *F*. After a certain time all the water in *A* will have passed into *H*. This water, called the distillate, is pure, the impurities which are contained before distillation remaining in the receptacle *A*.



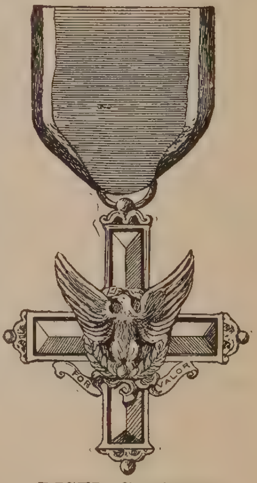
DISTILLATION

Destructive Distillation. In ordinary distillation substances do not undergo a chemical change, but what is called destructive distillation brings about such change. Wood, heated in a closed vessel, is changed to charcoal, while impure acetic acid, tar and some other bodies are driven off and condensed. When coal is so heated coal gas is produced; ammonia fumes are driven off, but not condensed; tar is driven off and condensed; coke is left behind.

Fractional Distillation. Not all liquids boil at the same degree of temperature. Therefore if a liquid composed of several mixtures such as crude petroleum is to be distilled the heat must be regulated by a thermometer. At a certain low temperature naphtha vaporizes and passes out through a tube leading to a condenser. When vapor stops rising at this temperature it is an indication that all the naphtha has passed out. The tube to the naphtha condenser is then closed, the temperature increased, and the tube opened into another condenser intended to receive the next product. In this manner gasoline, benzine, paraffine, heavy illuminating and lubricating oils, all products of petroleum, are separated and refined. This process is called fractional distillation.

DISTILLED LIQUORS, alcoholic liquors manufactured by the combined processes of fermentation and distillation. They may be made from raw material or directly from material which has been fermented, as in the manufacture of brandy by distilling wine. Most of the liquors, such as rum and whisky, are made directly from the raw material, corn, wheat and other grains being used. In some countries potatoes are used instead of grain. The grain is ground and soaked in warm water, preparing what is called the *mash*. Yeast is then added to this, and it is allowed to ferment, forming the *wort*. From this the spirit is distilled (see DISTILLATION). The distilled spirit usually contains numerous substances that are not desirable, and these are removed by redistilling at different temperatures or by allowing the liquor to stand for a long time, when they are either absorbed or evaporated. The purification is generally known as the process of rectifying. Rum is made directly from fermented molasses. See BRANDY; WHISKY.

DISTINGUISHED SERVICE MEDALS. Before the World War the United States provided for but one award for bravery in defense of the nation. This is the Congressional Medal of Honor, and it has been given but sparingly since the Civil War. The World War created a need for awards on the battlefield which should not have to await Congressional vote in each case. In 1918 a law created two new decorations, the Distinguished Service Cross and the Distinguished Service Medal.

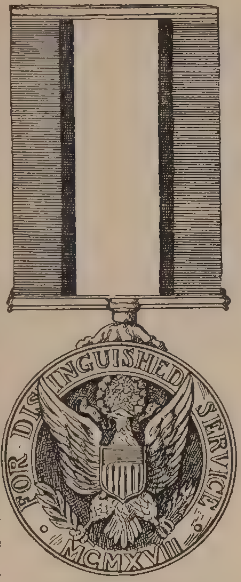


DISTINGUISHED SERVICE CROSS

The Distinguished Service Cross, the most important of the new decorations, may be awarded—

> "to any person who, while serving in any capacity with the army, shall hereafter distinguish himself or herself, or who, since April 6, 1917, has distinguished himself or herself,

> by extraordinary heroism in connection with military operations against an armed enemy of the United States."



DISTINGUISHED SERVICE MEDAL

The Distinguished Service Medal may be awarded to any man or woman serving in any capacity with the army who has, since April 6, 1917, or shall hereafter—

> "distinguish himself or herself by exceptionally meritorious service to the government in a duty of great responsibility in time of war or in connection with military operations against an armed enemy of the United States."

The cross is for deeds of valor in the field solely, while the medal may reward meritorious service in civilian capacities as well as in military activities.

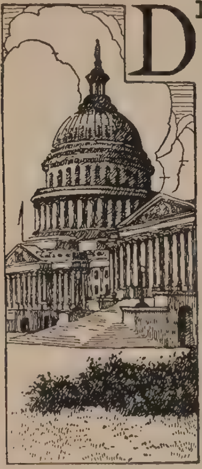
The distinguished service cross corresponds to the French croix de guerre (with palm), which may be won by both officers and men. There is no exact British counterpart. (See CROIX DE GUERRE.)

The commanding general in Europe was empowered to award either of the above upon receipt of cabled consent from the Secretary of War in Washington.

DISTRICT ATTORNEY, a term limited in its use to the American republic, is a law officer of a county and also of the United States. The district attorney of a county is one of the county officers, known in some states as *county attorney*, or *prosecuting attorney;* he is the state's legal representative in the county, and is charged with the duty of prosecuting those who violate the laws of the state.

A United States district attorney is an assistant of the Attorney-General of the United States in the Federal District in which he serves. He is appointed by the President and confirmed by the senate, for a term of four years. He prosecutes all violations of Federal laws within his jurisdiction. There are eighty-six District Attorneys in the states and in the territories of Alaska, Porto Rico and Hawaii.

DISTRICT COURTS, UNITED STATES. See COURTS, subhead *United States Courts.*

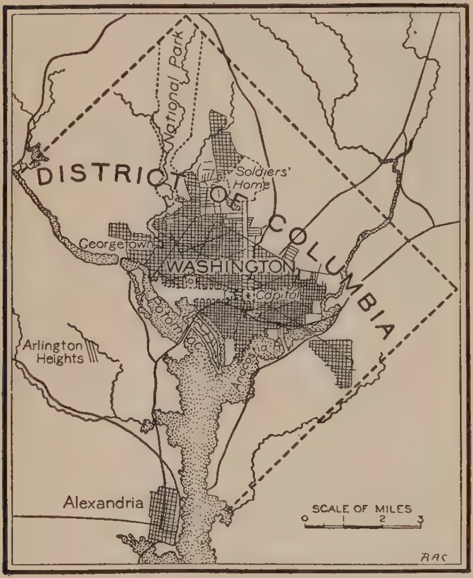


DISTRICT OF COLUMBIA, a Federal district within the United States which was organized to be the home of the general government. Provision for such a government center was made in the Constitution, which empowered Congress (in Art. I, Sec. 8)—

> To exercise exclusive legislation in all cases whatsoever over such district (not exceeding ten miles square) as may, by cession of particular States, and the acceptance of Congress, become the seat of the government of the United States.

Both Maryland and Virginia passed acts ceding such a tract to the United States, and in 1790 Congress passed a bill which established the tract upon the Potomac River, but left the President to locate it. This action of Congress, however, was not taken until after a very bitter debate among the members, many of whom felt it unwise to locate the seat of government in the midst of a comparative wilderness. But the choice was justified, in the minds of the public, because of George Washington's favorable opinion that the site chosen was "the only plot in the United States which had tidewater navigation, convenient access from Baltimore and other large cities northward, and superb natural sites." Originally, the tract contained exactly 100 square miles, a portion being on the south side of the Potomac, but this was ultimately ceded back to Virginia, and the present tract only, whose area is about 69 square miles, was retained. Besides Washington, Georgetown and Uniontown, there were within the District of Columbia several smaller villages, but the City of Washington now is coextensive with the entire District.

The government of the District is in the hands of three commissioners, two of whom are civilians, directly appointed by the President, and the third, an army engineer detailed by the Secretary of War. They hold office three years and are empowered by Congress to make and change at will health and police regulations and to make various laws governing the District. They appoint all subordinate clerks and officials. Each year they submit to the Secretary of the Treasury an estimate for all the expenditures of the District during the next year. Half of this amount is assessed as a tax upon the District, and the other half is appropriated by Congress. As the District is legally only the home of the Federal government the people residing in it have no vote. Government employes retain their residence in their home states and may go home to vote, when they so desire. The population of the District in 1910 was 331,069, of whom about 100,000 were colored; in 1917 a Federal estimate gave the number of people as 369,282, excluding thousands of temporary residents engaged in work connected with the World War. Census, 1920, 437,571.



DIVER, a water bird related to the grebe. The name is commonly applied to any bird that is a skilful diver. The true divers live chiefly in the Arctic regions, but come south in winter. The *great northern diver* and the *red-throated diver* are the most common species. The former has a white breast and a black back and wings, marked by white spots that present a checkerboard appearance, while the head and neck are glossy black and green, the latter with a collar of white streaks. The red-throated diver is duller in its coloring. In Scotland this bird is called the *rain goose,* while in the United States and Canada the great northern diver is generally called the *loon.* The loon migrates as far south as the Great Lakes, and most of the small lonely interior lakes of that latitude have one or two pairs of loons a season. Their cries are peculiarly noisy ones, some of their notes resembling rough, jeering laughter. If suddenly startled, especially when they have young in charge, they go through the most astonishing antics on the surface and below the water, trying evidently to distract the attention of an enemy.

GREAT NORTHERN DIVER

DIVIDE, in physiography the name given the crest or water-parting which separates two river systems, or the drainage areas of two smaller streams. The term *watershed* is also used to indicate the same feature. A divide may be comparatively low land, with slopes so gentle that they can scarcely be traced, as the Height of Land, which extends east and west across the central plain of North America and separates the Mississippi basin from the land drained into Hudson Bay. It may be very high, like the divide in the Rocky Mountains, that separates the rivers which flow into the Mississippi basin from those flowing into the Pacific. Rivers sometimes cut transverse valleys through a high divide; but this never occurs with a low divide, unless in a few localities the level may be such that in high water one portion of the stream flows down one slope and another portion flows down the other. This is illustrated in the cases of Twin River Lake in Yellowstone Park and the Cassiquiare River in South America.

DIV'IDEND, a cash return from capital invested in stocks of corporations. An investor in stocks is not sure of any return from his investment. He hopes that the business in which he buys shares will be profitable; if it prospers he will get his proportion of net profits. A dividend differs from *interest* in that interest is a fixed amount guaranteed on notes and bonds, and must be paid. See CORPORATION.

DIVINA′TION, the act of foretelling future events or discovering things secret or obscure, by the aid of superior beings or by other than human means. In ancient times divination was divided into two kinds, natural and artificial. *Natural* divination was supposed to be effected by a sort of divine inspiration; *artificial* divination was effected by certain rites, experiments or observations, as by sacrifices, observation of entrails and flight of birds, lots, omens and the position of the stars. This sort of divination was practiced by the conjurers, or medicine men, of the American Indians, and traces of it are still found among some tribes.

DIVINE RIGHT OF KINGS, the belief that sovereigns derive their right to rule from God, and that the people's disregard of their absolute authority constitutes a sin against God. This doctrine, celebrated in English history, especially in the time of the Stuarts, and in French history of Louis XIV's time, was defended in the twentieth century in the utterances of William II of Germany. With his defeat in the World War the theory died.

DI′VING, as an occupation, is the act of working under water, either with or without a supply of air. In the tropical regions the natives on the shore and those living on islands become expert divers in their quest after sponges and other salable articles obtained from the sea. Some of these are able to remain under water for two minutes, but they suffer from the effects of holding their breath so long.

The oldest successful diving apparatus, known as the *diving bell*, consists of a dome-shaped iron enclosure, open at the bottom and having a shelf or seat on which the diver can sit. When lowered into the water the air prevents the water from filling the chamber, and workmen can remain under water in a diving bell for a number of hours, provided they are supplied with fresh air. This is accomplished by forcing the air into the bell through a tube connected with a force pump, while another arrangement allows the foul air to escape.

In modern diving a specially devised waterproof suit is used, which has at the neck a metal ring. To this ring a copper helmet is screwed. The latter has circular glasses in front, for the diver to see through, and is equipped with two rubber tubes to provide for the transmission of pure air and the carrying off of the impure. By means of a telephone arrangement the diver may readily communicate with his fellow workers and the attendant above him. He is enabled to sink and to keep his balance by the aid of leaden soles and of metal sheets fastened to his suit, and his equipment includes electric lights and all necessary tools. The standard apparatus generally in use in England and America was devised by an Englishman. Divers can now go down to depths of nearly 300 feet. The British achieved notable results through their diving forces during the World War, in their work of salvaging sunken ships. (For the sport of diving, see the article SWIMMING.)

DIVINING ROD, a forked stick, by means of which persons formerly attempted to discover the location of minerals or water underground, believing that the rod, if carried slowly along by the two forked ends, would dip and point downward when brought over the spot where the mineral or water existed.

DIVISION OF LABOR. See LABOR, DIVISION OF.

DIVORCE, *di vors′*, the dissolution of marriage by a competent legal authority. The significance of the term has of late been narrowed to include only the dissolution of the union from causes arising after marriage, the legal dissolution of a marriage which was void from the beginning being called *nullification*. The decree of divorce is now usually granted by the regularly-organized courts, but the rite was formerly purely private, no legal ceremony being necessary. Gradually, with the improvement of religious and moral codes, the laws of divorce have become more stringent. Divorce is not recognized by the Roman Catholic Church, and its priests are not authorized to remarry divorced persons. The same rule long held in England, until changed by an act of Parliament in 1858. Since that time divorces are granted, but rarely, and for only very important reasons.

The divorce laws in the United States are regulated by the states and are widely divergent. One state, South Carolina, does not allow divorce, and the principles governing legislation vary from this strict rule to the greatest laxity. Among the causes for which divorces are granted are unfaithfulness, desertion, habitual drunkenness, cruelty, failure to support, gross immorality and incompatibility. In some states divorced persons may remarry without restriction, but in others the rule varies from absolute prohibition of remarriage to some slight restrictions as to time. In the case of divorce, if the wife is blameless she is usually granted a certain specified sum for her support, called *alimony*.

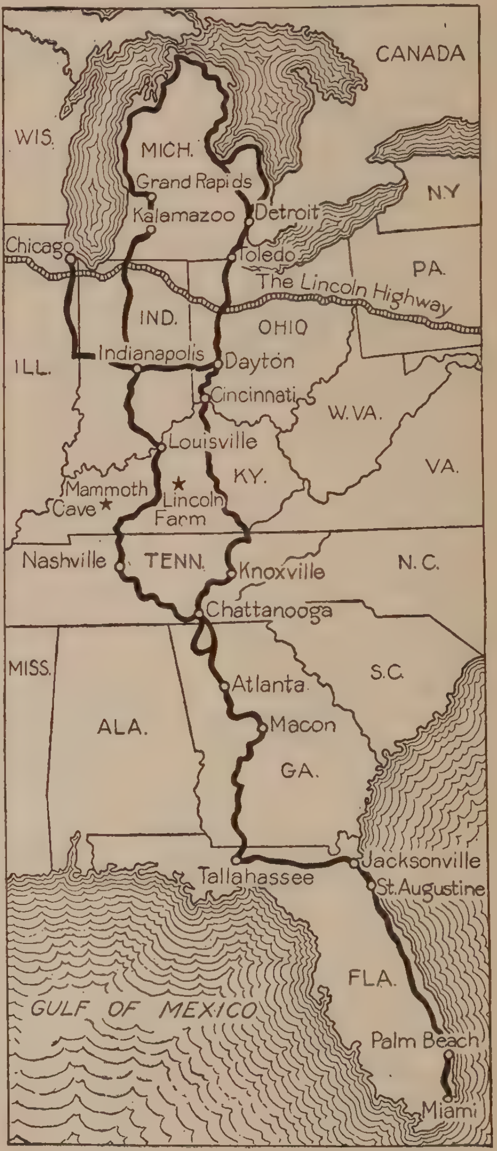
Within recent years there has been a great increase in the proportion of divorces to marriages in the United States, and consequently, a growing movement in favor of stricter laws upon the subject. Some students of the problem demand the regulation of divorce by a national law; others, by agreement of uniformity among the states.

In Canada the Dominion Parliament is the only legislative body having the power to pass marriage and divorce laws. By special legislation in each case it can grant divorces in the provinces of Alberta, Manitoba, the Northwest Territories, Quebec and Saskatchewan; in the provinces of New Brunswick, Nova Scotia and Prince Edward Island the courts are empowered to declare a marriage annulled for certain stipulated reasons. In the entire Dominion fewer than seventy-five divorces are granted in a year. See MARRIAGE; HUSBAND AND WIFE.

DIXIE, or **DIXIE-LAND**, a term which came, by a popular error, to be identified with the South during the Civil War. The story goes that early in the nineteenth century a man named Dixie lived on Manhattan Island and kept there a large number of slaves, whom he treated with great kindness. When feeling against slavery began to grow intense, Dixie sent some of his negroes South, and they, sorrowful at leaving their kind master, sighed for "Dixie's land." Daniel Emmett, the author of the everpopular song *Dixie*, used the refrain, "I wish I was in Dixie," as an expression of Northern negroes who longed for the sunny South.

DIXIE HIGHWAY, an excellent surfaced road which will eventually extend across the United States from north to south. The route has been marked throughout its length, and the highway in parts of its course has been completed. Beginning at Mackinaw, Michigan, routes extend through opposite sides of that state and on through Ohio, Indiana, Kentucky and Tennessee, joining at Chattanooga. They again diverge for a short distance, then unite, and thereafter as a single highway the course extends to Miami, Florida. From Indianapolis a branch will reach Chicago.

This new highway, in its inception, was designed to encourage between the North and the South more intimate acquaintance, for it will attract numberless automobile tourists. Of more importance, possibly, will be the greater incentive to local road building in all the states through which the highway passes, for it will demonstrate that good roads are a distinct asset to a community.



ROUTES OF THE DIXIE HIGHWAY

The Dixie Highway was first promoted in 1915 by a meeting of governors of states, who appointed local committees to lay out the route and to secure the coöperation of the people in the project. See LINCOLN HIGHWAY.

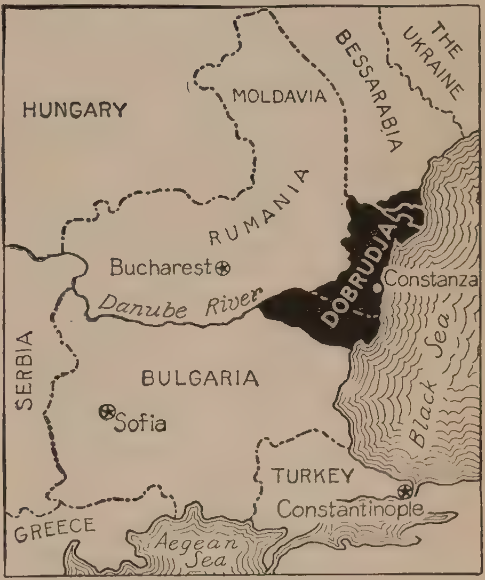
DIXON, THOMAS (1864–), American novelist and playwright, born at Shelby, N. C. In 1883 he received the degree of A. M. from Wake Forest College, N. C. Greensboro Law School conferred upon him the degree of LL. B. in 1886. The same year he was admitted to the North Carolina bar and to practice in the United States District and Supreme courts. His attainments won for him a scholarship in history and politics at Johns Hopkins University in 1883. Two years later he began to serve a term in the North Carolina legislature, but resigned to enter the ministry. He is author of several novels and plays, among which are *The Leopard's Spots, The Root of Evil* and *The Clansman,* the last of which has been dramatized and adapted to motion pictures under the title *Birth of a Nation.* In 1921 appeared *The Man in Gray.*

DIZ'ZINESS. See VERTIGO.

DNIEPER, *ne'pur,* a river in Russia, one of the largest in Europe. It rises in the region about 200 miles southwest of Moscow and flows first southwest, then southeast and again southwest, into the Black Sea. At its mouth it has a breadth of ten miles. It is navigable for nearly its entire length of 1,400 miles and is therefore of great commercial importance. It flows through one of the most important wheat-growing regions in the world, and waters an area of 203,000 square miles. In its lower course there are important fisheries. Among its tributaries are the Beresina, the Pripet, the Desna and the Psiol.

DNIESTER, *nee'stur,* a large river of Europe, which has its source in the Carpathian Mountains in former Austrian Galicia. It enters Russia at Khotin and flows into the Black Sea, after a course of about 850 miles. Navigation, once difficult on account of frequent shallows and rapids, was rendered possible through improvements made by the Russian government for a distance of 500 miles. Large quantities of lumber, fish and grain are transported on its waters.

DOBRUJA, or **DOBRUDJA**, *do broo'ja,* a fertile district in Southeastern Europe, bounded on the north and west by the Danube River and on the east by the Black Sea. It consists of two departments—Constantsa and Tulcha—whose combined area is 5,998 square miles. At the outbreak of the World War it had a population of 380,430. The population is mixed, consisting of Turks, Bulgars, Rumanians, Russians, Jews, Armenians and Germans. The Dobrudja was annexed to Rumania in 1878. In May, 1918, by the Treaty of Bucharest, Rumania was forced to cede the territory to the Germanic powers, but this treaty was rendered null and void by the subsequent collapse of the Germanic alliance, in the fall of the same year. The boundaries of reorganized Rumania were to be settled by the League of Nations, and she looked for the return of this territory. See RUMANIA; WORLD WAR.



LOCATION OF DOBRUDJA

DOCK, a name applied to various large, herbaceous plants belonging to the buckwheat family. The varieties common in the United States and Canada are known only as troublesome weeds, but the roots of other species are valuable on account of their medicinal properties. As much as 125,000 pounds of these roots have been imported into the United States in one year.

DOCKS, a word commonly used to mean a wharf—a long, narrow structure extending into the water, close to which vessels may be tied securely. The original meaning of the word, and the one yet correctly employed where the tides are high, refers to a solidly-built enclosure in which ships may be anchored, the dock being the basin containing the water which floats the ship; such a dock is not influenced by tides, because the water is held and does not recede with the ebb tide. Docks of this kind are known as *wet docks.* There are no high tides along the shores of the United States which require such shipping precautions, but there are a few such locations in Canada, notably in the Bay of Fundy, and many in Europe.

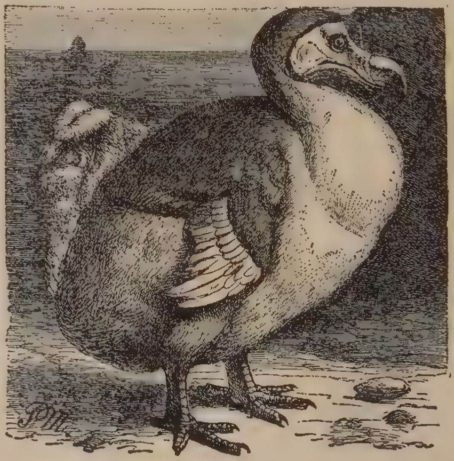
Dry Docks. These are built of strong masonry, and their entrance is closed by swinging gates, opening in the middle, or by a framework, called a *caisson,* built like the hull of a ship, with a keel and a stem at both ends. When the caisson is empty it floats and may be removed to admit of a vessel being floated into the dock. The caisson is then placed at the entrance and filled with water, again sinks into the grooves intended for it and closes the dock. The water is then pumped out, leaving the ship dry and supported by wooden blocks and props. Floating docks are made of wood or steel and are constructed in sections, any number of which can be fastened together to make a basin large enough for the ship. There are dry docks at nearly every great seaport.

DOCK′YARDS, yards supplied with all sorts of naval stores, materials and conveniences for the construction, repair and equipment of ships of war. Another name for them is *navy yards.* There are eight on the coasts of the United States—at Puget Sound, Wash.; Mare Island, Cal.; Portsmouth, N. H.; Boston; Brooklyn; Washington; Norfolk, and Philadelphia. Canada has dockyards at Halifax and at Esquimalt, B. C., for the convenience of British naval vessels.

DODDER, a parasite, native of Europe and parts of the United States. It is a member of the convolvulus family. The plant starts from the ground, sends up long, twining, leafless, yellowish, threadlike stems which fasten themselves by rootlets to other plants. It then breaks loose from the soil and feeds on the plant to which it has attached itself. In maturity the plant is covered with dense clusters of small white flowers. Dodder is injurious to some crops. To minimize its destructiveness it is often found necessary to sift the seeds of clover, alfalfa and flax before planting. See PARASITE.

DODGSON, *doj′son,* CHARLES LUTWIDGE (1832–1898), an English writer and mathematical scholar, best known as the author of those fascinating nonsense stories, *Alice in Wonderland* and *Through the Looking Glass.* Dodgson wrote under the name LEWIS CARROLL, except when he published certain weighty treatises on mathematics. The Alice of his children's stories was Alice Liddell, the daughter of the dean of Christ Church, Oxford. It was while he was a mathematical lecturer at Christ Church, between 1855 and 1881, that Dodgson became acquainted with the little girl and her sisters, and the adventures he so charmingly described were originally told to the children on afternoon boat rides down the river. He also published a series of *Sylvia and Bruno* stories. See ALICE'S ADVENTURES IN WONDERLAND.

DO′DO, an extinct genus of birds, said to be related to the pigeons. The dodo was a massive, clumsy bird, larger than a swan, and covered with down instead of feathers. It walked on short, ill-shaped legs and had wings and tail so short as to be useless for flight. The birds were once numerous on the island of Mauritius, but it has been two hundred years since the last one was seen. Several perfect specimens are preserved in the British Museum. They furnish the world's sole present knowledge of the bird.



THE DODO

DOG, a common domestic animal, intelligent and faithful to man, yet belonging to the same family as the wolf, the coyote, the jackal and the fox. That the dog is so remarkably different from these enemies of man is the result of many centuries of domestication. Man tamed the dog in a day before the earliest history was written, and while he is docile and obedient, as a rule, there are instances in plenty when he momentarily drops the veneer of civilization and reverts to type, bristling hair and bared teeth proving his kinship with the snarling wolf.

The Dog in History. The dog has been almost universally the most intimate friend of man. The annual overflow of the Nile which makes cultivation of the valley possible comes at the same time as the appearance of a certain star above the horizon. The ancient Egyptians called this Sirius, or the "dogstar;" they associated the faithfulness and watchfulness of the dog with the star which appeared as a blessing on their industry. Some nations, especially the Hebrews and Hindus, regarded the dog as unclean. In Mohammedan and Hindu countries the most degrading epithet that could be applied to anybody was "dog." This epithet seems to be due to their hatred of their enemies rather than to a dislike of the dog: when the Israelites saw that their Egyptian enemies worshiped the dog, their hatred of the Egyptians made them think of the dog as an enemy. So, too, the Mohammedan or the Hindu, who saw the affection of the Christian for his dog, disliked the dog just as much as he disliked the dog's master.

Until the beginning of the Christian Era the dog seems to have been used only as the defender of the home and a friend and companion of the master. Now he was trained to pursue other animals. Whether this training developed the peculiarities of the "hunting dog" or whether only dogs that showed these peculiarities were chosen for training, is not important. The fact remains that for many years dogs were roughly classed as "sporting" and "non-sporting." The swiftness and the highly developed power of scent are most noticeable in the sporting dogs, such as the pointers, setters and terriers.

It is not unlikely that all dogs sprang from one common source, but climate, food, and cross-breeding caused variations which in turn led to further breeding for special purposes. These variations have made some dogs better fitted for some purposes than any other dogs and so the breeding has gone on till there are now about two hundred breeds of domestic dogs.

Some have long, slender legs (for example, the greyhound); some have short, stout legs (for instance, the dachshund). Some have long, silky hair; some are almost hairless. Some have small, erect ears; others have long and tapering ears.

Classification. No entirely satisfactory classification of the different breeds of domestic dogs has been made; authorities do not all agree, but the following will serve for general purposes:

(1) Wolflike dogs. This class includes dogs of a large size, with long hair and erect ears, resembling the wolf in general appearance. Examples are the Eskimo dog and the collie.

(2) Greyhounds. Dogs of this class are slender, have fine, soft short hair and little power of scent. They are very fleet runners.

(3) Spaniels. This class is characterized by their long, hanging ears and curly coats. They all like the water and are used in hunting. The Saint Bernard and Newfoundland are conspicuous examples.

(4) Hounds. Hounds are distinguished by their short hair, long noses and long, hanging ears, and by the keen scent which guides them in tracing game.

(5) Mastiffs. These dogs have large heads and large, strong jaws, as in case of the bulldog.

(6) Terriers. This is a distinct class, including many varieties, which differ widely from one another. They have short or long hair, the ears are erect and the bodies are usually light.

The Dog as a Friend. We know that the dog has always been the companion and friend of his master. A dog will recognize his master's step or his voice; even if the dog cannot see or hear him he will recognize the scent. No other animal is so faithful to man; man appreciates and returns the devotion of the dog. One of the noblest tributes to the dog is part of an address to a jury made by Senator George Graham Vest during the trial of a man who had shot a fine dog belonging to a neighbor. The

Outline on the Dog

- I. DESCRIPTION
  - (1) Structure
  - (2) Size
  - (3) Characteristics
- II. USES
  - (1) Companionship and protection
  - (2) Hunting
  - (3) Work
- III. CLASSIFICATION
  - (1) Wolfhounds
    - (a) Eskimo
    - (b) Sheep-dog and collies
  - (2) Greyhounds
    - (a) English
    - (b) Scotch deerhound
    - (c) Russian
    - (d) Lurcher
    - (e) Italian
  - (3) Spaniels
    - (a) Setter
    - (b) Retriever
    - (c) Newfoundland
    - (d) St. Bernard
    - (e) Poodle
  - (4) Hounds
    - (a) Bloodhound
    - (b) Staghound
    - (c) Foxhound
    - (d) Harriers
    - (e) Pointers
    - (f) Dachshund
  - (5) Mastiffs
    - (a) English mastiff
    - (b) Bulldog
    - (c) German boar-hound
    - (d) Great Dane
    - (e) Pug
  - (6) Terriers
    - (a) Fox terrier
    - (b) Scotch terrier
    - (c) Skye terrier

eulogy is so remarkable for its simplicity and dignity that we quote it in full:

Gentlemen of the Jury: The best friend a man has in this world may turn against him and become his enemy. His son or his daughter, that he has reared with loving care, may prove ungrateful. Those who are nearest and dearest to us, those whom we trust with our happiness and our good name, may become traitors to their faith. The money that a man has he may lose. It flies away from him, perhaps when he needs it most. A man's reputation may be sacrificed in a moment of ill-considered action. The people who are prone to fall on their knees to do us honor when success is with us may be the first to throw stones of malice when failure settles its cloud upon our heads. The one absolutely unselfish friend that man can have in this selfish world, the one that never deserts him, the one that never proves ungrateful or treacherous, is his dog. Gentlemen of the jury, a man's dog stands by him in prosperity and in poverty, in health and in sickness. He will sleep on the cold ground, where the wintry winds blow and the snow drives fiercely, if only he may be near his master's side. He will kiss the hand that has no food to offer, he will lick the wounds and sores that come in encounter with the roughness of the world. He guards the sleep of his pauper master as if he were a prince. When all other friends desert, he remains. When riches take wings and reputation falls to pieces, he is as constant in his love as the sun in its journey through the heavens. If fortune drives the master forth an outcast in the world, friendless and homeless, the faithful dog asks no higher privilege than that of accompanying him to guard against danger, to fight against his enemies. And, when the last scene of all comes, and death takes the master in its embrace, and his body is laid away in the cold ground, no matter if all other friends pursue their way, there by his graveside will the noble dog be found, his head between his paws, his eyes sad but open in alert watchfulness, faithful and true even to death.

How to Study Dogs. There will be no difficulty in interesting the children in the subject of dogs. Urge them to notice the different points of dogs. Let them treat the dog not merely as an object of study but as a friend. No better lesson than unselfishness and kindness toward weaker creatures can be taught children. Let them see for themselves that a dog appreciates a kind deed as much as the child does.

Every child has seen a dog wag his tail with pleasure at the sight of his master. What effect does a scolding have on the dog?

Watch a dog eat. Does he gnaw or bite?

Study the head and muzzle. The different shapes will help to identify the breeds.

Notice the size and shape of the teeth.

Differences in the shape of the ears are noticeable. The ear which droops over at the top is called a button ear. What are some other shapes of the ear?

Compare the position of the eyes with the position of the eyes in a rabbit.

Are all dogs' eyes of the same color?

Is there any difference between the forefeet and hindfeet of a dog? How many toes are there on each foot?

Each child should observe one dog for several days. This is a much better method of teaching the habits of a dog than a general explanation.

Let the child see that the dog is able to care for himself in a great many ways. Surely every child has seen a dog bury a dry bone at some time or other. Why is it that another dog occasionally finds the bone?

Have all dogs an equally developed sense of smell? Of hearing?

Kinds. There are so many kinds of dogs that it is impossible for the child to learn even the names of all of them. But he should know the chief classifications and some of the characteristics of each. Under the separate headings of spaniel, terrier, collie, etc., will be found descriptions which will be of great assistance in this study.

Name some of the breeds of large dogs. What characteristics make them especially useful to man?

Most of the small dogs are merely companions. What are some of them?

Where are wild dogs found?

Why are bloodhounds so named?

What other animals are included in the family to which the dog belongs?

How do dogs compare with other animals in intelligence and affection?

From what does the St. Bernard dog derive its name? For what is it famous?

What dog was used by Landseer as a subject for one of his famous paintings.

What are some of the traits which make the Newfoundland dog popular?

Which is the most celebrated of all strains of shepherd dogs? What characteristics especially fit it for the care of sheep?

What is the chief use to which the Eskimo dog is put?

What is the most distinguishing feature of the greyhound? From what is the name probably derived?

What special sense marks the difference between the hound and the greyhound?

Related Articles. Consult the following titles for additional information:

Bloodhound
Bulldog
Collie
Dachshund
Dingo
Foxhound
Fox Terrier
Great Dane
Greyhound
Hound
Mastiff
Newfoundland
Pointer
Poodle
Pug
Retriever
Saint Bernard
Scotch Terrier
Setter
Shepherd Dog
Skye Terrier
Spaniel
Spitz
Staghound
Terrier
Zoölogy

DOG'BANE, a North American plant found between Canada and the latitude of Tennessee. One species grows to about four feet, has a smooth stem, milky juice and clusters of pink bell-shaped flowers. The root is bitter and is used as a substitute for ipecac to cause vomiting. Another species, called *Canadian,* or *Indian, hemp,* is valued for its fine, strong fibre, which is used by the Indians for weaving, and in net-making.

DOG DAYS, the name applied by the ancients to a period of about forty days, the hottest season of the year, at the time of the rising of Sirius, the dog star. Though the star now rises at a different time, we still apply the term *dog days* to the hottest season of the year.

DOGE, *doje,* the title of the first magistrate in the old Italian republics of Venice and Genoa. In the former the office was established in the eighth century; in the latter, in the fourteenth. The Venetian doges, for four centuries elected by the people and afterwards by the Great Council, held office for life. The doge of Genoa, until early in the sixteenth century, held a life incumbency, but the term of the office was afterwards restricted to two years. The office was abolished by the French in 1797. The doge's palace is one of the remarkable buildings of Venice to-day.

DOG'FISH, a name given to several species of small shark, common around the British Isles, so named from their habit of pursuing prey like dogs hunting. The rough skin of one of the species, the *lesser spotted dogfish,* is used in polishing various substances, particularly wood. This species is rarely three feet long. The *greater dogfish* is from three to five feet in length. It is a blackish-brown in color, marked with numerous small dark spots. Both species are very voracious and destructive. Their flesh is hard, dry and unpalatable. The *common,* or *picked, dogfish* is common in North American seas and is sometimes used as food. On the Pacific coast oil is made from the livers of the dogfish.

DOG'GERBANK, an extensive sand bank in the North Sea, about midway between the shores of England and Denmark, beginning about thirty-six miles east of Flamborough Head and extending in an easterly-northeasterly direction to within sixty miles of Jutland. In some places it is sixty miles wide. It is celebrated for its cod fisheries.

DOG'MA, an article of religious belief, a doctrine of Christian faith. The history of dogma, as a branch of theology, traces the origins of, and the changes in, the various systems of belief. It shows what opinions were current among Christians in times past, the sources of the various creeds, by what arguments they were attacked and by what supported, what measure of importance was attached to them at various times, the circumstances by which they were affected, and the manner in which dogmas were combined in systems.

DOG STAR. See SIRIUS; also DOG, subhead *The Dog in History.*

DOG-TOOTH VIOLET, the common name for a plant of the lily family, which blooms in spring in Canada and the Northern United States. It is an odd-shaped plant, and is as oddly named, for it is not related to the violet, and does not resemble a dog's tooth. Two smooth and usually mottled leaves spring from a scaly bulb, and a single nodding yellow, purplish or white flower is borne from between the leaves on a short stem. An illustration of the dog-tooth violet in color accompanies the article LILY, on page 2106.

DOG'WATCH, a nautical term distinguishing two watches of two hours each (4 to 6 P. M. and 6 to 8 P. M.). All the other watches count four hours each, and if the dog watches were not introduced the same portion of the crew would always keep watch during the same hours.

DOL'DRUMS, among seamen, the parts of the ocean near the equator, that abound in calms, squalls and light baffling winds. In the days of sailing vessels the doldrums were the despair of captains and crews.

DOLE, SANFORD BALLAND (1844–), a Hawaiian statesman, of American parentage, born in Honolulu. He was graduated at Williams College (Mass.) and was admitted to the bar in Boston. After some political activity there he returned to Hawaii, and his principal work has been inseparable from the history of the island. In 1893, after he had served as Supreme Court judge, he was placed at the head of the provisional government, and from 1894 to 1900 served as president of the republic of Hawaii. When Hawaii became a territory of the United States Dole was appointed governor (1900–1903), and has since served twelve years as United States district judge on the island (see HAWAII).

DOLL, a toy that is a favorite with small girls throughout the world, regardless of race, color or locality. So far back as history goes dolls of some sort have been played with by the children of all nations, for the instinct that makes a girl love to fondle and pet a figure of a baby is a universal instinct of the female sex. The most elaborate dolls on the market to-day have jointed bodies, eyes that open and shut, beautiful wigs of soft hair, and a speaking apparatus by which they cry or say "Mamma."

A sort of earthenware known as bisque is used quite generally for heads and bodies, but wood, China, papier mâché and wax are also employed for heads, and dolls' bodies made of cloth with sawdust stuffing are common. The figures may represent babies, society belles, negro mammies, soldiers, sailors, and so on, in great variety. Cloth dolls with printed patterns for hair and features are inexpensive and practicable toys for very little children. Rubber dolls are also popular. The doll industry is a factory industry in the United States, but in Europe large numbers of these toys are made in the homes of the peasants.

DOL'LAR, a silver or gold coin, the unit of the monetary systems of the United States and Canada, with a value of 100 cents. The table of comparative value of coins in the article COINS will explain the relative value of the dollar and foreign monetary units.

The name is derived from the Dutch *daler* or German *thaler,* but the coin used in the United States was patterned on "the Spanish milled dollar." The dollar was established as the monetary unit of the United States by an act of Congress under the Confederation in 1787, the decimal system of coinage having been established the year before. The first United States silver dollars were made in 1794. On March 14, 1900, an act was passed which made the gold dollar the standard in the United States; it was coined for some years, but because of its small size and consequent inconvenience in handling its coinage has been discontinued. The gold dollar has therefore risen in sentimental value; any person who wishes to purchase one must pay $2 or $3 for it. Silver dollars have not been coined since 1905. See COINING; MONEY.

DOL'OMITE, or MAGNE'SIAN LIMESTONE, a carbonate of calcium and magnesium. It is found in crystals, also massive, as limestone. Dolomite rock abounds in Europe, the mountains of Switzerland, Italy, Austria and England being formed of it. In the United States it occurs in the western part of New England, the eastern part of New York, Georgia and Tennessee. A variety called *bitter spar,* and sometimes *rhomb spar,* is found in crystals having the form of a rhomboid. In color it is gray, yellow or reddish-brown, and it is semi-transparent. It is easily scratched with a knife. A second variety is called *pearl spar;* this has crystals with curved surfaces and is of a pearly luster. It is a good building stone, and certain varieties make fine statuary marble. Dolomite, when subjected to heat, yields a cement material which is used extensively for linings of Bessemer converters.

DOLPHIN, *dol′fin,* an animal which forms the type of a family that includes, also, the porpoise and the narwhal. It inhabits every sea from the equator to the poles. The common dolphin measures from six to ten feet in length and has a sharp snout about a half-foot long. It is usually black above, gray on the sides and white beneath. Its flesh is coarse, rank and disagreeable, but it is used by the Laplanders as food. The dolphins live on fish and mollusca, and often they may be seen in great numbers around shoals of herring. They have to come to the surface at short intervals to breathe. The structure of the ear renders the sense of hearing very acute, and the animals are observed to be attracted by regular or harmonious sounds. Compactness and strength are the characteristics of these animals, and they swim with extraordinary velocity.

The dolphin is most common in the Mediterranean, but one species, the *bottle-nosed,* is caught on the coast of New Jersey. Other species which are taken off the coast of the United States are the *black dolphin* and the *spotted dolphin.* The name is also commonly but improperly given to a fish of the mackerel family, which changes its colors when dying, and shows many beautiful shades. In Greek mythology the dolphin was sacred to Apollo. Its image appeared on Greek coins and is said to have been represented on the shield of Ulysses.

DOME, a vaulted roof, in the shape of a hemisphere, or sometimes of an octagon or an ellipse, covering a building or part of it and forming a common feature of Byzantine and Renaissance architecture. *Cupola* is often used as a synonym, but, strictly speaking, the latter term refers to the interior, *dome* being applied to the exterior. In common usage, however, the entire structure is included under the name dome.

Most modern domes are semi-elliptical and are constructed of timber, but the ancient domes were nearly hemispherical and were constructed of stone. The finest, without any rival, ancient or modern, is that of the Rotunda or Pantheon at Rome, 140 feet in diameter and 143 feet in height, erected under Augustus and still in perfect condition. Among others the most noteworthy are Saint Peter's at Rome, 138 feet in diameter; Saint Paul's in London, 102 feet in diameter, and that of the Hotel des Invalides in Paris, ninety-two feet in diameter. The finest dome in the United States is that of the Capitol at Washington, measuring ninety-six feet in diameter. A dome 152 feet in diameter was erected on the Palace of Horticulture at the Panama-Pacific Exposition, in 1915, but this was only a temporary structure.

DOMENICHINO, *do ma ne ché′no,* or **DOMENICO ZAMPIERI** (1581–1641), an Italian painter of great eminence, belonging to the Bolognese school. He was born at Bologna, and studied there and at Rome, where he painted his masterpiece, *Last Communion of Saint Jerome,* now in the Vatican, and numerous frescoes representing religious and mythological subjects. After four years in Bologna, he returned to Rome in 1621 and became principal architect and painter in the Papal Palace. The best of his later works are *The Four Evangelists* and *Diana and Her Nymphs Bathing.* Domenichino's distinguishing merit was the naturalness of his human figures. He was one of the first painters to use successfully naturalistic landscape as a background for human figures.

DOMESDAY, *doomz′day,* **BOOK,** or **DOOMSDAY BOOK,** a book showing the results of the land survey ordered by William the Conqueror, about 1086. The survey was made by commissioners, who collected their information in each district from a sworn jury consisting of sheriffs, lords of manors, presbyters, bailiffs, villeins—all the classes, in short, interested in the matter. The extent, tenure, value and proprietorship of the land in each district, the state of culture and in some cases the number of tenants, villeins and serfs were among the matters recorded. The survey was completed within a year. Northumberland, Durham, Cumberland and Westmoreland were not included in the survey, probably for the reason that William's authority was not then fully established in those counties. The Domesday Book consists of two volumes, one folio and one quarto. It has been twice republished, the last time (1861–1865) in perfect facsimile.

DOMESTIC SCIENCE. Not very many years ago those words would have looked very strange together; no one seeing or hearing them would have understood what they meant. The word *science* was, to most people, a word reserved for technical subjects. There was a science of geology, a science of botany, a science of astronomy; but about the domestic life, with its almost infinite number of big and little duties, there was little or nothing that was recognized as scientific. Even to-day, of course, the words would mean nothing to thousands and thousands of housewives, but gradually the ideas which they convey are becoming more and more widely spread, more and more willingly accepted.

Of late years scientific interest in all things has been increasing, and as a natural consequence scientific knowledge has been growing. That "domestic" science came late is due to the fact that it concerns itself with affairs which are so universal, so constantly and unobtrusively before our eyes as to seem commonplace. But little by little people came to see that there was, in the running of the usual household, an enormous waste of time, of energy, of money. Nothing like an adequate return was being received for the outlay that was made. The result, gradual and still uncompleted, was the systematizing of domestic affairs.

Changes in Household Occupations. Centuries ago the duties of a household were far different from what they are to-day. The women prepared all the food, cared for the house, spun the yarn, made the cloth from which clothing was made, and then in turn made the clothing. The education of a girl consisted largely if not exclusively of training in such household duties. But conditions within and without the home changed so that all of this became very different. First, there came the invention of machines which did much of the work women had been accustomed to do; it did not pay a woman to labor hours and weeks making "homespun," when factory-made cloth, as good and far more attractive, could be bought reasonably. The growth of factories of all kinds carried this result further and further; more and more industries were taken out of the hands of the housewives and transferred to factories. This tendency was strengthened by the growth of cities; when people lived by themselves, a long distance from a neighbor, perhaps, they were dependent in large measure on their own resources, but when they moved to crowded centers of population they found many things within their reach which before it had been well-nigh impossible to obtain.

Then, too, the desires and ambitions of women have changed. They are no longer satisfied to spend every minute of the day drudging at housework, even work which is in itself very pleasant becoming the merest drudgery when it must be performed day after day without relaxation or recreation. Women have taken up other occupations, have discovered how good it is to be out-of-doors, have formed societies and clubs of all sorts; have, in short, built up for themselves a social life which makes demands on time and energy which to our grandmothers would have seemed incredible.

One of the results of these various facts is that many of the old household duties are becoming lost arts. The young girl is not trained in domestic affairs in the home; she has no time and little inclination for such things, and in many instances her mother has no more. Besides, conditions have changed so that the necessity for such home education is less apparent. Suppose a girl is called on some day to manage a household. It will, in many cases, be a steam-heated flat in which she will live. Everything for the flat can be bought—even the taste to furnish it, for there are people who, for a fee, supply ideas for the furnishing and decoration of homes. Her clothes can be bought ready-made, from the simplest shirtwaist to the most elaborate evening gown. Bakeshops and delicatessen shops supply cooked foods of all varieties, hot from the oven, if desired. Why should a girl spend time in learning to do things which she can so easily have done for her?

Importance of Domestic Science. The realization of the fact that the old household accomplishments are being in large measure neglected has had much to do with the zeal with which wise men and women have tried to advance the cause of domestic science. For the answer of the girl to whom we referred in the preceding paragraph to domestic questions is in reality far from being the right or the wise answer. There are problems in the household which can never be met until the housewife understands every detail of the management as thoroughly as did the old-fashioned housekeeper, even if she does not do nearly so large a proportion of the work. It is not necessary that a woman should go back to the days of the spinning wheel, and insist on making the cloth from which her winter suit is to be fashioned; but she should know enough about fabrics to judge wisely of the materials which do go into the suit. The cooking problem differs in a measure from the problem of textiles and of clothing; for while there are shops where foods of all kinds are prepared, and in many instances well prepared, there are reasons why the habitual patronizing of such shops is not a wise policy. In the first place, such prepared foods are by no means always so healthful; in the second place, they are far more expensive. In the case of meats, for example, it is estimated that one pays almost double for cooked meats—and then they are usually neither as palatable nor as digestible.

It is more true in the case of domestic duties than in almost any other class of industries that a person is fit to have things done for him only when he knows how to do them himself. A man who owns a shoe store does not need to know how the workman operates the machine which cuts out the soles; but a housewife can tell whether things are being done properly and economically only if she thoroughly understands every process. If she knows the price of the various cuts of corned beef, the length of time it takes to cook them and the consequent cost of fuel, she can easily tell whether or not she is paying an utterly unreasonable amount for cooked corned beef.

When we realize that it is an established fact that ninety per cent of the salary is paid out by the woman of the average household for shelter, clothing, foodstuffs, etc., we begin to understand how extremely important it is that the woman who is to oversee this outlay should be able to do it intelligently. If a teacher had before her a class of fifty boys, and knew that almost all of them were to be architects, she would certainly find her teaching much modified by that fact. With a class of girls, it is known for a certainty that a large proportion will be engaged in some phase of home-making. Is it not of importance, then, that some recognition should be made of this fact in their teaching?

Necessity for Knowledge of Foodstuffs. The question of food is naturally one of the first and most important problems taken up by the student of domestic science, or domestic economy, as it is sometimes called. The points to be covered in the study of foods are many—why we need food, what kinds we need, how much we need, how it should be prepared, what it costs, and so on. We need look no further than our regular newspapers and periodicals to convince ourselves that this subject is becoming a vital and a generally interesting one. Nearly every newspaper we pick up gives a corner to some phase of the problem—perhaps to the question of the healthfulness of certain foods, perhaps to economy in the preparation of foods, perhaps merely to recipes. And then, there are whole magazines devoted to such questions as diet and vegetarianism. You may pick up a magazine one day which proves conclusively that only raw foods should be eaten if the highest standard of health is to be maintained; the next day you may read equally convincing articles to the effect that all foods should be thoroughly cooked. These references do not mean that the present brief treatment of the subject is to be argumentative, is to advance any theory or champion any idea. They are simply brought forward to prove that the question is a live one.

It is not the purpose of the present article to give exhaustive technical information on foods and foodstuffs, the average housewife does not need such extended acquaintance with the subject. She does need, however, general information as to the elements required by the body, the foods which can supply those elements, and the combinations of foodstuffs best calculated to work good results. Such information can be given in a form which is comparatively untechnical, so that the housewife or student with little or no previous training in science can understand it.

It is true that a large proportion of diseases are traceable directly to the stomach, and many of these might be prevented if intelligent care were exercised. If the housewife understands this fact, it will help her to realize as nothing else can the necessity for knowledge of foodstuffs.

What the Body Needs. A plant growing in soil which is well suited to it takes up just exactly those substances which it needs to make it grow best. There are certain things it draws in through its roots and leaves and manufactures into food; the other elements of the soil it disregards altogether. In the same way, there are certain substances which the body needs—without which it cannot do its best work. But the body cannot always get just what it needs as simply as does the plant. Certain necessary elements are not given to it at all, or are given only in inadequate quantities; certain hurtful elements are thrust upon it, or things which in themselves are harmless are given to it in too large quantities.

It stands to reason that the food of the body, taken as a whole, must contain all the elements which the body contains. We do not need, in a discussion of this sort, to consider these in detail, or even to mention them all. The elements do not exist by themselves; they combine to make up the various substances which we use as food; for example, hydrogen and oxygen, two very necessary elements, are found combined in water.

There are three things which food must do—it must furnish materials for replacing worn-out body tissues; it must give energy for work, and it must supply animal heat. Of course, no one kind of food can perform all three of these functions equally well, and that is why we need a mixed diet. That is why, too, certain combinations of food, as, for example, cheese and meat, are not considered good—they provide too much of one element and not enough of some others.

Food-substances in general may be divided into three groups—minerals, substances which contain nitrogen, and those which contain no nitrogen.

Chief of the mineral substances is water. We all realize that water is extremely important, in fact that we could not live without it, but probably we do not appreciate how universal it is. All foodstuffs contain it, in varying percentages from ten to ninety-five, and from two-thirds to three-fourths of the body consists of it. Every part of the body contains it, even the enamel of the teeth, though of course there the percentage is very small. Water furnishes no energy, but as a solvent it aids digestion, and it has an important part to play in the replacing of worn-out tissue by new.

The other minerals needed by the body include such things as lime, salt, soda, and iron. Though the proportion of such substances in the body is small—not more than about five per cent—they are absolutely necessary, and it has been proved that if all the other food elements are supplied in proper quantities but these mineral substances are lacking, death is the certain result. However, it is not often that one has to plan on supplying these minerals; the ordinary diet contains enough of them to supply all needs, except in unusual cases.

The second class of foods named—those compounds containing nitrogen—is a large and very important class. The name given to these foods is *proteins,* and since the name is becoming quite common we shall make use of it here. There are three classes of proteins, the first and most essential of which is called *albuminoids.* Albumen exists in the lean part of meat, the white of an egg, the casein of milk (that part which is coagulated by acids) and the gluten of wheat. These substances are absolutely necessary; life cannot go on without them. All of the three functions which food must perform—the building up of tissue, the supplying of energy, the supplying of heat—these substances perform. They do not, however, perform them all in equal degree, and so other foods are necessary. But the albuminoids are more nearly capable of maintaining life unaided than is any other class of substances.

The second class of proteins, called *gelatinoids,* is not nearly so necessary, though these substances have certain qualifications which make them valuable. They are very easy of digestion, and are for that reason often given to invalids and convalescents. The typical example of this form of foodstuffs is gelatin.

The *extractives,* the third class of proteins, include the juices obtained by soaking meat in water, at a low temperature—not much higher than 160° Fahrenheit. The beef tea so much used for invalids is made by this process. Formerly it was believed that there was much nourishment in such beef tea—that it contained all the strength of the meat; but it is now known that such things really supply nothing for the maintenance of the body, and it is not unlikely that people have been starved to death while being fed on supposedly nutritious beef tea.

The third division of food-substances—those compounds which do not contain nitrogen—is divided into two classes, called *carbohydrates* and *hydrocarbons.* We use these technical terms simply because there are no other names to use in their stead, but it is not necessary that we should know the chemical compounds of the substances. When the term carbohydrates is used we may understand a class of substances of vegetable origin, of which sugar and starch are the most important. These compounds furnish much of the energy of the body, and some animal heat, but the chief heat-producers are the other class of this third division—the hydrocarbons. These are the oils and fats of all kinds, whether of vegetable or animal origin.

It is important that the food taken into the body should not only contain the right elements but that it should contain them in the right proportion. Physicians and chemists have spent much time and thought in figuring out just what this proportion should be. Tests have been made by having people eat different kinds of foods in different proportions, and some interesting facts have been discovered. Of course the results of such tests never could be expected to be absolutely alike, but the best authorities agree that to keep in good health the average grown person should have each day food which will provide him with food elements about as follows:

Protein, 1¾ ounces; fat, 1¾ ounces; carbohydrate, 16 ounces.

This translated into terms of food such as we eat would be about 5¾ ounces of beef, 1¾ ounces of butter, 6 ounces of potatoes, and 19 ounces of bread. Of course such a statement does not mean that we must have every day just those articles; if some other kind of meat is used, which contains more fat, less butter is required, if cheese is used, the quantity of meat may be lessened; the starch-furnishing potatoes may be replaced by other starchy foods, and the bread may include cake or other things which have largely the same ingredients as bread. But practically these proportions should be maintained. There are, naturally, many things which are not taken into account here; nothing is said, for example, of water, of which any normal diet should contain a goodly quantity.

Special Foods

Water. Since water is such an extremely important part of our diet, it may well be given very serious attention. As clear, pure water is a good preserver of health, so impure water is one of the greatest breeders of disease. The question can never be "Shall I drink water or not?"—it must always be "What kind of water shall I drink?" The word *pure* as generally used is really a relative term; no water is strictly pure except distilled water, and a very, very small proportion of the water used for drinking purposes is distilled.

The water that we use comes from wells, lakes, rivers and springs, and all of it contains, in greater or less degree, lime and other salts. These, however, unless they are present in unusually large quantities, do no harm; the danger in impure water comes largely from the presence of decaying vegetable or animal matter. Such diseases as typhoid fever and diphtheria are often caused by impurities in the water supply, as are various forms of more or less violent intestinal disorders. In the case of those living near wells or springs from which water is secured, the greatest care should be exercised. No refuse of any kind, liquid or dry, should be thrown on the ground near the well or spring, or above it; for almost certainly, if such a thing is done, the impurities sink through the ground and find their way to the source of the water supply. People in towns or cities which have a public water system can of course have no such personal supervision over the source of the water supply; but they can exercise care enough to assure themselves of the purity of the water which is supplied to their homes. The safest way is to have samples of the water analyzed by a chemist, but there are certain simple and fairly good tests which anyone can make as to the conditions of the water.

The first one is the test with permanganate of potash, which may be made as follows:

Partially fill a clean teacup with the water to be tested, and add about sixty drops of weak sulphuric acid. Then pour in a weak solution of permanganate of potash (crystals of this substance can be obtained at any drug store) until the water in the teacup becomes a deep rose color. If there is harmful organic matter in the water, the beautiful color will soon disappear.

A still simpler test is as follows: Into a bottle which holds about two ounces of water drop granulated sugar equal in quantity to a pea. Place the cork in the bottle, and set the solution in a warm place for forty-eight hours. If the water, when the cork is removed, has an unpleasant smell, it is too impure to be safely used.

As to the methods to be used in purifying water, there are two in common practice. First, there is filtering, the simplest method, though not the most satisfactory. For filtering, while it does remove some impurities, is likely to allow some of them to pass through. The other method is boiling. This kills the organic matter and renders the water practically safe. It has, however, one drawback—it leaves the water flat and insipid; but if the water is poured back and forth from one vessel to another several times, it takes up again some of the gases which it loses by the boiling process, and tastes much more like fresh water.

The great importance of an uncontaminated water supply is being universally recognized. A number of states have already passed laws prohibiting public drinking cups at public fountains and in stations, office-buildings, department stores, and all places where a large number of people would be likely to use such drinking cups.

Milk. This important food is discussed under its proper heading in a separate article.

Eggs. Eggs are in their chemical composition very much like milk, but they are not so perfect a food, for they lack one important food element—the carbohydrates. However, if eggs are served with some starchy food, such as potato or rice or white bread, they form a complete food. At almost all seasons of the year eggs are cheaper than the choice cuts of meat, of which they take the place excellently. It is not, however, as a food in themselves that eggs are most important, but as an ingredient in innumerable combinations. Experiments have shown that eggs are much more easily digested if they are cooked at a temperature of from 150° to 180° Fahrenheit, and since this is also the proper temperature for milk, dishes composed mainly of milk and eggs, such as custards, should not be heated above that point. Of course, if cornstarch is used, it requires a higher temperature, but it is usually possible to cook the starch before the eggs are added.

Meats. There is no difference of opinion as to the absolute necessity of water; there is little difference of opinion as to the value of eggs and milk. But when we come to the subject of meat, opinions do differ. Many people insist that meat is not a fit article for food, that it does actual harm; others merely believe that it is not necessary. However that may be, it is certain that most of us use meat, and it is equally certain that almost always meat forms the most expensive part of the daily food. In many cases, by the expenditure of a little thought and care, substitutes for meat, such as cheese, nuts or eggs, can be used; in other cases, the more inexpensive cuts might be used, with no decrease in the nutritive value, and sometimes even with an increase.

At the outset of any study on meats there is one important topic which must be taken up—the selection of meat. By buying guaranteed milk or eggs we are fairly sure that we get the best of those substances which the market affords; but it is not enough to request the butcher to send meat that is fresh and not tough. Meat, more than any other article of food, should be selected by the housewife; only then can she be sure that she secures what she wants. A little study will acquaint her with the different cuts, and with the comparative values of them as foodstuffs. Almost any butcher will be glad, at an hour when he is not too busy, to help a customer in acquiring the knowledge she needs, for intelligence in buying will make his work easier. We give here an illustration which shows the location of the various cuts of beef; it is impossible to give such diagrams of all the animals whose flesh is used as food, but they are all built much on the same plan.

The first thing to consider in buying meat is the color and grain—good or poor meats may usually be distinguished in that way. Good beef is firm, fine-grained, of a purplish red when first cut, but changing very quickly after exposure to air to a bright red. The fat should be of a light straw color, the suet firm, white and crumbly. If the lean is dark-colored, coarse and flabby and the fat dark yellow, it is certain that the beef is of poor quality. Veal, at its best, is fine-grained, tender and almost white; the fat is firm and white. If the flesh is flabby and has a bluish tinge it should never be eaten, as it is absolutely unhealthful. In mutton, the bones should be small, the meat fine-grained, rich red and juicy, and the fat white and firm. There should be plenty of fat, as a lean animal does not yield good meat. Spring lamb is from six weeks to about six months old. The lean of the meat should be pink, the fat delicate and white. Fresh pork, above all other meats, if used at all should be of good quality, for pork which comes from animals in poor condition is very harmful. It is absolutely necessary that pork should be thoroughly cooked; there is no part of it that may be left "rare," as is done with steaks and lamb chops.

The meat from different parts of the animal varies in several ways; some of it is tough, some tender; some is dry, some juicy; some has much flavor, some is comparatively tasteless. These differences determine largely the uses to which the various parts are put.

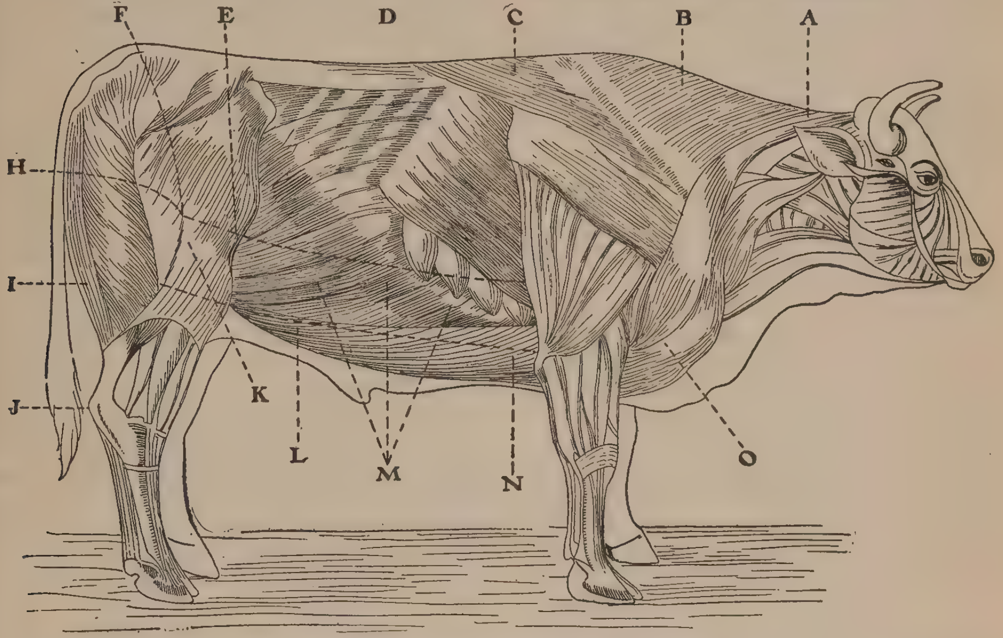


DIAGRAM SHOWING CUTS OF BEEF

A, neck; B–C, chuck ribs and shoulder-blade; C–D, seven prime ribs; D–E, porterhouse; E–F, thick sirloin; F–H, rump; H–I, round; J, leg; K, top of sirloin; L, flank; M, plate piece; N, O, brisket.

The loin of beef (D to F in the figure) is considered the choicest part, and is therefore the most expensive. It is used for roasts or steaks, giving porterhouse, sirloin and short steaks. The prime ribs, as they are called (C–D in the figure), are used for roasting. It is poor economy to buy one rib, even though the family is small; two will give much better results, and the "leftover" may be utilized in many ways.

The meat from the top of the round is often used for steaks, and while it is not always very tender, it has a good flavor. It is fine, also, for pot-pies or for boiling; since it has little bone and almost no fat, there is little waste. The rump is sometimes, from a prime animal, excellent for a roast, as are the ribs from B to C. Unless, however, the meat is tender, it is better used for braising or for pot-roasting. The flank and the leg are used for stewing or for making soup.

Broiling. Though raw meat is easily digested, we do not serve it on our tables. In order to make it more appetizing in flavor and more attractive in appearance, we cook it, and the cooking may be done in various ways. Primitive men, of course, had no way of cooking their meat except before or over an open fire, and we have kept their method in the simplest of our ways of cooking—that is, broiling. This method is used in cooking tender cuts of meat, such as steak, chops and cutlets, and for some kinds of fish. The heat at first should be intense, so that the surface may be quickly seared. In this way the juices are prevented from escaping. After the coating is formed on the outside, the heat should be lessened. To cook a steak or chop about one inch thick to medium rareness, keep it close to the fire for about two minutes, then draw it a little distance away. It should be turned often.

Roasting. Roasting was originally practically the same as broiling, the only difference being in the thickness of the piece of meat to be cooked. However, such constant attention and such frequent turning were necessary that the old open-fire method of roasting was given up; what we call roasting to-day is practically baking. The same principle holds as in broiling—the heat should be great at the outset and then decreased. A temperature of 350° Fahrenheit is none too great for the first half-hour or thereabouts, until the meat is browned on all sides. The heat should then be checked, a temperature of somewhere near 200 being sufficient for the remainder of the time. Roasting meat should be basted frequently with the drippings in the pan, as this makes the meat juicy.

Boiling. Meat to be boiled should be, like that to be broiled or roasted, subjected to severe heat at first, that the juices may be kept in. It should be put into boiling water and boiled rapidly for fifteen or twenty minutes; then the heat should be lessened until the water barely simmers. When a bubble of air rises from the bottom of the pan every few seconds, the temperature is about right. All boiled or stewed meats are far more tender, juicy and nutritious if cooked in this way than they are if boiled rapidly. It takes, however, a longer time to cook them done. A fairly good-sized piece of fresh beef must cook for about five hours to be well done; a ham of about ten pounds, or a piece of corned beef, unless it is very thin, will take about the same time. The "fireless cooker" is very satisfactory in boiling or stewing meats, just for the reason that it keeps them for hours at a simmering point. The meat is boiled for fifteen or twenty minutes, then the kettle is covered closely and placed in a box which is filled with hay, or some other non-conductor of heat. The box is then made as nearly air-tight as possible, and the water remains hot enough to cook meat for several hours.

Stewing is practically the same as boiling except that it is done in less water, and that the meat is usually cut up into smaller pieces. The temperature must be kept considerably below the boiling point. In braising and fricasseeing and pot-roasting the meats are first browned in hot fat and then stewed slowly.

Frying. Properly speaking, frying is boiling in hot fat, but the name is more commonly applied to the process of cooking in a pan, the bottom of which has been covered with fat. The former method is the better, as it is not so wasteful of the fat, which may be used more than once, and as it preserves the juices of the meat or fish better. The temperature of fat suitable for frying ranges from 300° to 400° Fahrenheit. Frying is the least healthful method for the preparation of food, and should not be used often.

Soup-Making. As in roasting or boiling the object is to keep the juices in the meat, in soup-making the object is to draw them out. Consequently the meat is cut into small pieces and put into cold water, which is then gradually brought to a temperature near the boiling point.

Starchy Foods. Starchy foods include various things besides starch, but the starch is the important principle in their makeup. All vegetables do not contain starch—for example, carrots, onions, turnips and tomatoes; but many of our important vegetables, as potatoes, beans and peas, are largely composed of it. The cereals, too, are starchy foods.

In cooking milk, eggs and meat we have seen that the most satisfactory method is to keep them throughout at a temperature well below the boiling point. With vegetables no such caution is necessary; in fact, most vegetables are better if cooked at a temperature above the boiling point, and all vegetables should be thoroughly cooked, though not overdone. Some vegetables, as potatoes and squash, have water enough in their composition to cook themselves and may accordingly be baked, or boiled in just enough water to cover them. In boiling meats, it is better to have the cover pushed a little aside, that the air may escape; but vegetables are better cooked with a tight cover to the kettle.

There are certain kinds of vegetables, such as lettuce, radishes, cress and celery, which are usually eaten raw. This is not only because they taste better in this state, but because they are more easily digested. In eating raw foods of any kind, it is always very necessary that they be clean and fresh.

Nutritive value is not the only thing to be considered in the selection of a dietary. Some foods, especially certain fruits and salads, contain little nutrition but are of the utmost importance because of their effect on the digestive process. They bring about certain reactions which are very helpful. Fruit and salads should form an important item in the diet of every normal person.

The grains, wheat, rye, corn, barley, oats, which are from six- to seven-tenths starch, are chiefly used in two ways—as cereals and in doughs. Doughs include any mixture of flour of any sort with milk or water, no matter what the proportions or what the other ingredients may be. As in the case of starchy vegetables, it is necessary that all cereals and all doughs be thoroughly cooked, as underdone starch is very indigestible. Many housewives dry out their bread in the oven after it has been cut, and it is certain that some people can eat such twice-baked bread who cannot with comfort eat fresh, soft breads.

It is hoped that enough has been said to show in what a proper diet should consist. To sum up: the weight of authority seems to decide that a mixed diet is best—that vegetables and other starchy foods, fat in moderation, sugars, lean meat should all be used. The methods of combination are also important. As has been pointed out above, meat should not be served with eggs or with cheese—they supply more than is necessary of the same element. Starchy foods should, on the other hand, always be served with eggs, for eggs lack the starch elements. Watery vegetables and fruits should not be used together to make up a meal, as the combination is likely to cause fermentation.

Sanitation and Ventilation

There are no more important questions connected with the home than those of sanitation and ventilation. If people always built their own houses, a wise supervision at the time of construction could settle many problems once and for all. By far the larger proportion of people, however, live in houses or flats that have been built by others, and in those cases the most that can be done is to exercise great care in the selection of a location and to remedy so far as possible existing defects.

Drainage. The drainage is an extremely important point. Stagnant water should never be allowed to remain near a house, as it breeds all manner of diseases, and shows, moreover, a defective drainage system. If a house stands by itself, in a neighborhood where there is no sewage system, it is absolutely necessary, if the inhabitants are to keep well, that drain pipes be provided to carry waste water from the premises. The custom of throwing the water out near the house is as unsanitary as it is unsightly. Such a drain should empty as far as possible from the house—three hundred feet is a good minimum distance; and if possible the opening should be lower than the house. If a break of any kind is allowed to exist in drainage pipes for any length of time, much harm can be done by the injurious sewer gas.

Plumbing. Plumbing is a subject which is closely related to drainage. In communities where there is a public sewage system, the owners of houses have little to do directly with the drainage, but every family should understand the plumbing in its own house well enough to be sure that it is kept in proper order. A safe rule is that plumbing should be "open," that is, not boxed up, so that defects may be found easily; and that it should be as simple as possible. A plumber who is called in at any time to make repairs will gladly explain the simpler points of the system, so that small faults may be detected and corrected.

Water Supply. This is a point which should be second to none in the selection of a location for a home. The topic has, however, been fully discussed under the subject of food, and need only be emphasized here. The fact that there is a public system which supplies water to hundreds or thousands of homes does not necessarily mean that the water is always safe. Usually, however, the public is kept informed by the board of health as to the condition of the water supply so that proper precautions may be taken. In the country, where people depend on springs or wells, great care is necessary, especially in the case of the former. The ground near the spring should be guarded so that surface water cannot get in, and under no circumstances should waste of any sort be thrown near the spring. Wells should be lined to the bottom with cement, that surface water may not soak in from the sides, and should be as deep as possible. If there are inequalities in the ground, the well or spring should never be lower than the barn or outbuildings.

Cleanliness. Dust and dirt are not merely unsightly; they are harmful, as well. We have all stood in a darkened room to which only one sunbeam had entrance and watched the dust particles dance in the streak of light. It is hard, sometimes, for us to believe that the light has not some attraction for the dust—it seems impossible that all the air is

Outline on Domestic Science

- I. Foods
  - 1. Classification
    - (a) Nitrogenous—Proteins
      - (1) Albuminoids
        - (a) White of eggs
        - (b) Blood serum
        - (c) Lean meat
        - (d) Casein of milk
        - (e) Gluten
      - (2) Gelatinoids
      - (3) Extractives
    - (b) Non-nitrogenous
      - (1) Fats
      - (2) Carbohydrates
        - (a) Starch
        - (b) Sugar
        - (c) Vegetable acids
    - (c) Mineral
      - (1) Water
      - (2) Salts and acids
  - 2. Food Values
    - (a) Heat production
    - (b) Nutrition
  - 3. Marketing
  - 4. Cooking
    - (a) Purposes
      - (1) To change food so that it becomes more digestible
      - (2) To make food more appetizing
      - (3) To free food from organic impurities
    - (b) Methods of applying heat
      - (1) Radiation
      - (2) Convection
      - (3) Conduction
    - (c) Special foods
      - (1) Milk
        - (a) Production of butter and cheese
        - (b) Changes produced by cooking
      - (2) Eggs
      - (3) Meats
        - (a) Relative values of different cuts
        - (b) Methods of cooking
          - (1) Broiling
          - (2) Roasting
          - (3) Frying
          - (4) Boiling
          - (5) Baking
      - (4) Starchy foods
        - (a) Vegetables
        - (b) Grains
          - (1) Cereals
          - (2) Doughs
      - (5) Drinks
- II. Clothing
  - 1. Materials
    - (a) Sources
      - (1) Cotton
      - (2) Wool
      - (3) Flax
      - (4) Silk
    - (b) Methods of preparing
      - (1) Spinning
      - (2) Weaving
      - (3) Dyeing
      - (4) Printing
    - (c) Adaptability to purposes
  - 2. Making
    - (a) Cutting and fitting
    - (b) Hand sewing
    - (c) Machine sewing
    - (d) Embroidery, fancy work
  - 3. Patching and darning
- III. Household Economics
  - 1. Sanitation
    - (a) Drainage
    - (b) Water supply
    - (c) Plumbing
    - (d) Warming and ventilating
    - (e) Cleanliness
  - 2. Furnishing
    - (a) Decorations
      - (1) Color schemes
      - (2) Materials
    - (b) Ornaments
    - (c) Articles of furniture
  - 3. Care of the house
    - (a) Care of the floors
    - (b) Dusting
    - (c) Dish-washing
    - (d) Bed-making
- IV. Care of Person
  - 1. Care of clothing
  - 2. Bathing
  - 3. Care of teeth, nails, hair.

as full of dust as the streak in which we can see it. But we really know that such is the case. Dust contains particles of matter from the body and the breath, and cannot fail to injure those by whom it is breathed. Even what we call "clean dust" has a very irritating effect on the lining of the nose and throat, and the so-called "dust catarrh" is common. It stands to reason that little is accomplished by dusting with a dry cloth. The dust is merely stirred up, transferred from the furniture to the air. A dampened or oiled cloth should be used, or a damp chamois skin; and the dust should be gathered up instead of being brushed off. The inexpensive vacuum cleaners have done much to aid in getting rid of the injurious dust.

Insect Pests. Of late years we understand more clearly what a great amount of harm comes from the insect pests which are so troublesome to almost every housekeeper. Bedbugs have always been detested, and roaches have been treated as real enemies to the household; the common fly has always been looked upon simply as a nuisance but not particularly as a menace. It is likely, however, that more injury is done by flies in the household than by any other insect, because they are so much more numerous and because housekeepers who would not tolerate roaches or bugs of any sort put up with flies. When we consider where flies spend much of their time, about the refuse heaps and garbage cans and stables where their eggs are laid, it is clear that they must carry about on their feet much filth. In the house they alight instantly on any food that is left about uncovered, thus leaving the germs where they are certain to be taken into the stomach. That typhoid fever is spread by flies is not a proved fact, but it is positive that some diseases are so carried. It is not an easy matter to get rid of flies, but it can be done. Every opening should be closely screened, and the greatest care should be exercised when the screen doors are opened. Whenever a fly is seen indoors it should be killed.

Mosquitoes, too, are known to be carriers of disease, notably yellow fever. We are, however, not in quite so much danger from mosquitoes as from flies, for mosquitoes are such a pest that nobody is likely to allow them to remain in a house if it is at all avoidable. It is to be hoped that the

Questions

What is the meaning of the word *domestic*?

What advantage came to housewives when no longer obliged to make "homespun" cloths for family clothing?

Does the fact that women to-day take more time for recreation than formerly necessarily indicate that any household duties are neglected?

Is it economical for the average family to patronize bakeshops and delicatessen stores? What has occasioned the popular demand for these institutions?

In your opinion does the household conducted according to the teachings of domestic science find its expense is increased beyond the sum needed previous to the introduction of scientific housekeeping?

Can one learn from a non-scientific volume the various desirable combinations of food, with respect to chemical needs?

What mineral substance is most essential to life? Does this mineral supply energy? What is its main function?

Learn the meaning of albuminoids, then make a list of foods containing albumin.

What proportion of food should be albuminoids?

Is coffee a food? In what respects do you consider it a useful beverage?

How can you determine whether your well water is nominally pure?

Is the law a proper one which banishes public drinking cups?

Explain carefully why milk is an excellent food. If not a perfect article of food, what does it lack? In saying that an article is a perfect food what do you understand by the statement?

What chemical changes occur in boiling a potato?

Is an egg hard-boiled or soft-boiled more easily digested?

What should be the appearance of a satisfactory cut of beef-steak?

What is a fireless cooker? Upon what principle is it constructed?

time will come when a housekeeper will be as much ashamed to have flies or mosquitoes seen about the house as she is now to have bugs or cockroaches.

Ventilation. This is a subject which is receiving so much attention now that at times we grow almost tired of it, and wish the discussion would cease. Despite that fact, we all realize, to a certain extent, its importance; it is doubtful whether many of us who have not given the subject definite study do really understand how serious it is. We content ourselves with the general knowledge that everyone needs fresh air to keep in good health, and do not go further into the question. It is safe to say that the most of us do not have enough fresh air through the greater part of the day.

Too much cannot be said, at the outset, on the need for fresh air during sleeping hours. It is believed now by most authorities that the ideal way is to sleep out-of-doors in all but the most severe weather; some people remain out all winter, taking care, of course, to have clothing and bedding which is as light as possible, but warm, for there is no merit to be gained from getting cold at night. If we cannot sleep out-of-doors, the next best thing is to make the sleeping room as near like out-of-doors as possible. There are people who even in hot weather have their bedroom windows raised but a few inches, held so, perhaps, by a burglar catch; but if windows are to be opened but a little, it is almost safer to have it be in the summer than in the winter. For in the winter the house has been closed during the day, and the air has been vitiated by the artificial heat and by the breath and bodily impurities of people, who are much more likely to remain in the house in the winter than in the summer. It is a safe rule to make that a bedroom window should almost always be wide open; of course there are times when a high wind or a storm makes this impossible. A bed should not, however, stand directly in a draught, though no harm can come from allowing a breeze to blow into the face.

But when we have made our sleeping conditions as nearly ideal as possible we have done by no means all, for we spend but about a third of our time in sleep. In some carefully built modern homes there are devices which provide for ventilation mechanically; but unless there is such a system which brings air into the house there is no way to get fresh air except to open doors and windows. Even in the coldest weather the house should be thoroughly aired at least once a day, and there should be some opening which constantly allows air to come into the house.

The latest authorities declare that it is not enough to have outside air admitted—that that provides only one element. The other element needed is moisture. You have noticed that when you go into a hot, dry room your eyes smart and burn. This is because the dry air, constantly seeking to become less dry, takes up the moisture which protects your eyeballs. It does the same to the lining of the nose and mouth. Now the moisture exists in those membranes for protective reasons, and harm is certain to come from its drying up. These authorities plead for moisture in the air. Keep water on the stove at a boiling point, they advise, and colds and catarrh will certainly be lessened. Then, too, when the air is kept full of moisture, the temperature may be lower than when the air is dry without causing discomfort. A room kept at 60° Fahrenheit would ordinarily be considered too cold; but when the air is moist, 60° is quite comfortable. There is an instrument called the hygrometer which measures and records the amount of moisture which is present in the air.

Related Articles. Consult the following titles for additional information:

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Furniture
Heating and Ventilation
Hygiene
Milk
Physical Culture
Pure Food Laws
Thrift
Ventilation

DOMINICA, *dohme ne'kah,* a British West India island, a member of the united colony of the Leeward Islands, between Martinique and Guadeloupe. It covers an area of 291 square miles. It is rugged and mountainous, but it contains many fertile valleys and is well watered. Vegetables, spices, fruits, coffee and cacao are the chief products. The shores are but little indented and are entirely without harbors, but on the west side there are several good anchorages and bays. Roseau is the capital. The ownership of Dominica alternated between France and Great Britain until 1814. Population in 1921, 37,059.

DOMINICAN, *doh min'i kan,* **REPUBLIC.** See Santo Domingo.

DOMIN'ICANS, an Order of preaching friars, founded in 1215 by Saint Dominic, who wished thereby to increase the influence of the Church. He obtained confirmation for his order from Pope Honorius III in 1216, and this gave the friars the right to preach and to hear confessions wherever they went. The members are bound by vows of chastity, poverty and obedience, are forbidden ever to eat meat, are under obligation to rise at midnight for prayer. They have been displaced in part by the Jesuits. They were known in France as *Jacobins,* in England as *Black Friars,* from the black cloak and hood they wore. Four of the Popes have come from the Order, and of famous painters Fra Angelico and Fra Bartolommeo. Thomas Aquinas and Albertus Magnus were Dominicans. As they were fierce defenders of Church dogma, some member of the Order usually conducted the Spanish Inquisition (which see).

DOMINION DAY, one of Canada's most important holidays, commemorating the confederation of the provinces into the Dominion of Canada under the British North America Act of 1867. The Dominion came into existence on July 1 of that year, and each year on that day the anniversary is celebrated. See BRITISH NORTH AMERICA ACT.

DOMINOES, *dom'in oze,* a game played with small, flat, rectangular pieces of ivory, about twice as long as they are broad. Each piece is divided in the middle by a line, and each of the squares thus made is blank or marked by dots, from one to six or twelve in number. When one player leads by laying down a domino, the next must follow by placing alongside of it another, which has the same number of spots on one of its sides. Thus, if the first player lays down 6–4, the second may reply with 4–8, or 6–7; in the former case he must turn in the 4, placing it beside the 4 of the first domino, so that the numbers remaining out will be 6–8; in the latter case he must turn in the 6 to the 6 in like manner, leaving 4–7, to which his opponent must now respond. The player who cannot follow suit loses his turn, and the object of the game is to get rid of all the dominoes in hand, or to hold fewer spots than an opponent when the game is exhausted by neither being able to play. Other games with different styles of counting are played with dominoes. The game was first played in Europe, in the middle of the eighteenth century.

DOMITIAN, *do mish'e an* (?–96), a Roman emperor, son of Vespasian. He succeeded his brother Titus in the year 81. He began his rule with a show of moderation and justice, but lapsed into the sort of cruelty and excess for which his youth had been notorious. He was assassinated.

DON (ancient Tanais), a river of Russia, which issues from Lake Ivan-Ozero, about 150 miles south of Moscow and flows southeast to within thirty-seven miles of the Volga, where it turns abruptly and flows southwest for 236 miles and empties into the Sea of Azov. Its length is nearly 1,150 miles. The chief tributaries are the Donetz, the Voronej, the Khoper and the Manitsch. The Don carries a large traffic, especially during the spring flood. A canal connects it with the Volga system of navigation. It has extensive fisheries.

DONATEL'LO, or **DONATO,** *do nah'to,* (1386?–1466), an Italian sculptor, one of the most famous of the early Renaissance and one of the greatest of all time. He was born at Florence and was brought up in the home of Martelli, a wealthy relative. Early he became associated with Brunelleschi, the architect, from whom he gained much encouragement and help. In 1403 both went to Rome and studied there together for two years. Donatello then returned to Florence. His first great works were *Saint Peter* and *Saint Mark,* in the Church of Saint Michael in Florence. In 1433 Donatello returned to Rome, and the works produced during the period immediately following show to a great extent the influence of classical art on his work. The next year he returned to Florence and was employed by his friend and patron Cosimo de Medici, for whom he designed a beautiful bronze statute, *David,* his best-known work. In 1444 he went to Padua and there produced a bronze equestrian statue of Erasmo de Narni, called *Gattamelata,* his greatest work. After visiting Venice, Ferrara and other cities, he returned to Florence in 1457 and passed the rest of his life there.

The distinguishing features of his art are realism and originality. He was the most revolutionary of artists, and though he closely followed antique models, his productions are not imitations, but are original and true to nature. His influence affected the sculpture of Florence throughout the fifteenth century, up to the time of Michelangelo.

DONGO′LA, a province of Anglo-Egyptian Sudan, under control of the British, lying on both sides of the Nile River, south of Egypt proper. There are about 55,000 natives, who raise wheat and dates. There is railroad connection north into Egypt and to the Red Sea.

DONIZET′TI, Gaetano (1797–1848), a famous Italian composer. In 1835 he produced the operas *Lucia di Lammermoor* and *Lucrezia Borgia*, both emphatically successful, the first of which is considered his masterpiece. In the same year he removed to Paris, where he afterwards wrote and produced several operas, *Les Martyrs, La Favorita, La Traviata, Don Pasquale* and *La Fille du Regiment,* all of which enjoy permanent popularity.

DON JUAN, *don hwahn,* the hero of a Spanish legend, which seems to have had some historical basis in the life of a member of the noble family of Tenorio at Seville. According to the legend Don Juan was recklessly immoral. An insult to the daughter of a governor of Seville brought the indignant father and the profligate young man into deadly conflict, in which the former was slain. Don Juan afterward, in a spirit of wild mockery, went to the grave of the murdered man and invited his statue to a revel. To the terror of Don Juan, the "stony guest" actually appeared at the table to bear him away to hell. The legend has furnished the subject for many dramas, among them Molière's *Don Juan* and Shadwell's *The Libertine,* and for many operas, the most famous of which is Mozart's *Don Giovanni.* The *Don Juan* of Byron bears no relation to the old story, except in the character of the hero.

DON′KEY, the name given to the ass when domesticated. See Ass.

DON′NELLY, Ignatius (1831–1901), an American journalist and politician. He studied law, was admitted to the bar and in 1856 went to Minnesota, where he was three years later elected lieutenant-governor. From 1863 to 1869 he was in the House of Representatives, for many years he was in the state legislature and twice he was nominated for Vice-President of the United States by the People's party. Among his writings the one which attracted most attention was *The Great Cryptogram,* which attempted to prove, by means of a word-cipher, that Bacon wrote Shakespeare's plays.

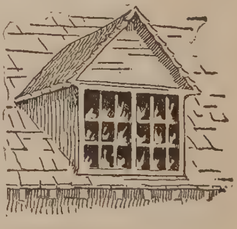
DON QUIXOTE, *don ke ho′tah,* a famous Spanish novel by Cervantes. The book was written to ridicule the absurd notions of knight errantry current in the sixteenth century. Don Quixote, the hero, accompanied on his travels by his servant Sancho Panza, tries to create romance out of the most commonplace situations and consequently becomes involved in all sorts of trouble. Besides being a parody on the chivalry of the time, the book is a brilliant satire on human nature. See Cervantes, Miguel de.

DORE, *do ra′,* Paul Gustave (1833–1883), a prolific French draftsman and painter, born at Strassburg. He distinguished himself as an illustrator of books. His illustrations of Rabelais, of Perrault's *Tales,* Sue's *Wandering Jew,* Dante's *Divina Commedia* and Cervantes's *Don Quixote* acquired for him a European reputation. Doré's pictures are especially interesting because of the fertility of invention and dramatic instinct revealed in them. His symbolic landscapes enhance the dramatic effect of his scenes. His illustrations of the Bible are among the most widely known of his works.

DO′RIANS, one of the four great branches of the Greek nation. They migrated from Thessaly southward in the twelfth or eleventh century B. C., settling for a time in the mountainous district of Doris, in Northern Greece, and finally in the Peloponnesus. Their chief representatives of the historic era were the Spartans.

DORIC ORDER. See Column.

DOR′MER WINDOW, a window set in the gable of a sloping roof, the frame being nearly vertical to the rafters. It was an important feature in early Gothic architecture and in the later Renaissance. See Gable.


DORMER WINDOW

DOR′MOUSE, a small rodent, common in Europe, resembling the squirrel in its habits and its hairy tail. These little animals inhabit temperate and warm countries and subsist entirely on vegetable food. Their pace is a kind of leap, but they have not the activity of squirrels. While feeding, they sit upright and carry the food to the mouth with their paws. The dormice pass the winter in a torpid state, reviving only for a short time on a warm, sunny day, when they take a little of their hoarded stores and then relapse into sleep. Among the different species are the *fat dormouse* and the *garden dormouse.*

DORMOUSE

DORR'S REBELLION, an incident in Rhode Island history in which Thomas Dorr took the leading part. As a member of the state legislature (1833–1837) he headed a party for extending the suffrage, which was still restricted, according to the old charter, by a property qualification. Two constitutions were placed before the people for adoption, and that embodying Dorr's reform received a majority of votes, but it was declared illegally adopted. Dorr was also elected governor, and his followers attempted to sustain their government by force of arms. The attempt failed, Dorr was convicted of treason and was sentenced to imprisonment for life, but was afterwards pardoned.

DORTMUND, *dawrt'moont,* GERMANY, a city of Prussia in the province of Westphalia, situated near the River Ems, seventy-three miles northeast of Cologne. Dortmund has rapidly increased in population in recent years, its prosperity being due to its situation upon several important railway systems, to the opening of extensive coal mines in the vicinity and to the active manufacture of iron, steel and machinery. There are also a number of breweries, potteries, tobacco factories and chemical works, and during the World War the city became an important center for the manufacture of munitions. Dortmund was once a free imperial Hanseatic town and was the seat of the chief tribunal of the Vehme. Population, 1910, 214,333; 1918, 568,055 (due to the demand for munitions). Census, 1919, 295,026.

DOU, or **DOW,** GERARD (1613–1675), an eminent painter of the Dutch school, born at Leyden. He studied under Rembrandt and united his master's manner in handling light and shade with the most minute finish and delicacy. His first work consisted chiefly of portraits, but his greatest achievement was in the field of genre painting. His scenes of domestic and common life are depicted in a tender and charming style. The best specimens of his are *Woman Sick of the Dropsy, The Bible Reader* and *Grocer Woman.*

DOUAI, *doo á,* **BIBLE,** the English translation of the Bible made by divines connected with the English College at Douai, France, and used by English-speaking Catholics. The New Testament was published in 1582 at Rheims; the Old, in 1609, at Douai. The translation is made from the Vulgate, or Latin version.

DOUBLE STARS, any pair of stars revolving about a common center. It is thought probable that wherever two stars appear very close together in the heavens, they revolve about each other. Sometimes a revolution requires centuries, sometimes it requires thousands of years. See ALGOL.

DOUGHERTY, DENNIS J., an American cardinal of the Roman Catholic Church. For a number of years his work centered in the Philippine Islands. In 1915 he returned to the United States and was appointed bishop of Buffalo, N. Y. In 1921 he succeeded Cardinal John M. Farley, whose death left this high post vacant.

DOUGLAS, *dug'las,* ARIZ., a city in Colchis County, thirty-three miles southeast of Bisbee, on the El Paso & Southwestern and the Nacozari Railroad of Mexico. Two of America's greatest copper smelters are located here, and there are cement, gypsum and plaster works. Douglas became an important army post when the Mexican revolution threatened to involve the United States. Population, 1920, 9,916.

DOUGLAS, STEPHEN ARNOLD (1813–1861), one of the leading statesmen of America of the period leading up to the Civil War. Slight of stature, but possessed of superb oratorical powers, he was known universally as the "Little Giant." Though born in Vermont, his career did not begin until he became a citizen of Illinois.

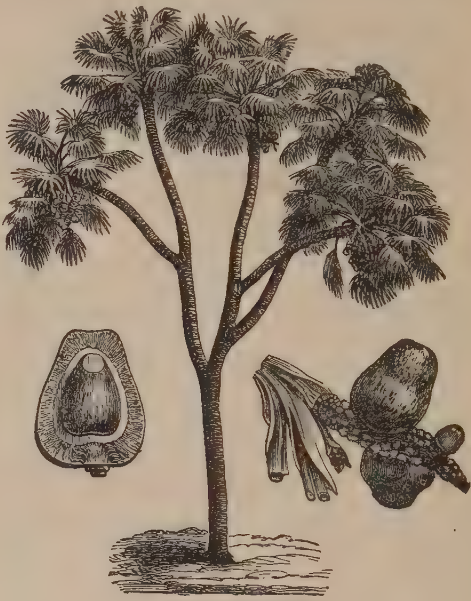
In Jacksonville in 1834 he was admitted to the bar. Within a year he became prosecuting attorney for his district. He was elected to the lower house of the state legislature in 1836, and in 1841 he was appointed secretary of state for Illinois, but resigned to become judge of the supreme court. Two years later he entered the national House of Representatives, and in 1847 he was chosen United States Senator, which position he filled until his death. He became a leader of the Democratic party, favoring the annexation of Texas, the Mexican War and most of the measures looking toward the extension of slavery. He opposed the Wilmot Proviso, but upheld the compromise of 1850.

STEPHEN A. DOUGLAS

As an advocate of slavery he was careful not to alienate the people of either the North or the South, since it was his ambition to become President of the United States. He therefore introduced into Congress the doctrine known as "popular," or "squatter," sovereignty (see SQUATTER SOVEREIGNTY) which held that to the citizens of each territory belonged the right to determine, through their representatives, whether slavery should be admitted to that territory, but that meanwhile slavery should be allowed. Douglas was therefore the most conspicuous supporter of the Kansas-Nebraska Bill (which see). No single event of the period before the Civil War had greater influence in arousing anti-slavery agitation than this law.

In 1858 Douglas was opposed in his campaign for reëlection by Abraham Lincoln, who had risen to prominence in Illinois. During this campaign occurred the famous debates between Lincoln and Douglas, in which the whole problem of slavery and its extension was discussed with remarkable ability by both candidates. Though Douglas was successful, his position on the slavery question cost him the support of the Southern wing of his party in his campaign for the Presidency in 1860. Though nominated by the Northern Democrats, he received only twelve electoral votes, those of Missouri and part of New Jersey. However, he received a popular vote second only to that of Lincoln. When the Civil War broke out, and the issue was between union and secession, he was a strong supporter of President Lincoln, but died a few months after the beginning of the struggle.

DOUM PALM, *doom′pahm,* a palm tree, remarkable for having repeatedly-branching stems. Each branch terminates in a tuft of large, fan-shaped leaves. The fruit is about the size of an apple. It has a fibrous, mealy rind, which tastes like gingerbread and is eaten by the poorer inhabitants of Upper Egypt, where the doum palm grows.


DOUM PALM

DOURO, *do′e ro,* a river of Spain and Portugal, navigable only in the Portuguese part of its course. It rises in the province of Soria, Spain, over a mile above the sea, and after many turns flows southwesterly for sixty miles between Spain and Portugal, and then westward across the latter country, emptying into the Atlantic Ocean three miles west of Oporto. Its entire course is 485 miles. The Douro is used to transport wines from interior Portugal to Oporto.

DOVE, *duv,* a name which scientifically has no distinction from *pigeon,* but which is commonly applied to a few species of pigeons, notably the mourning, ring, scaled and ground doves. Of these the best known is the mourning dove, a member of the family of turtle doves (see TURTLE DOVE). In poetry and in legend the dove has always been the symbol of innocence, gentleness and love, and in the Christian religion it has occupied a prominent position. It was a dove that Noah sent from the ark; a dove rested on the head of Christ after his baptism, and Saint John "saw the Spirit descending from heaven like a dove." The dove appears in innumerable pictures throughout all periods of Christian art.

DOVER, Del., the capital of the state and the county seat of Kent County, forty-eight miles south of Wilmington, on the unnavigable Saint Jones River, and on the Philadelphia, Wilmington & Baltimore railroad. The town is in a fruit region and contains fruit-canning and evaporating works, sawmills, foundries and machine shops. Wilmington Conference Academy and an agricultural and manual training school for colored students are located here. The statehouse, the county courthouse and the post office are important buildings. Dover was settled in 1717. It was made the capital in 1777 and was incorporated as a town in 1829. Population, 1920, 4,042.

DOVER, England, an important seaport and trading town in the county of Kent, sixty-seven miles southeast of London. It lies on the coast of the Strait of Dover, and is twenty-one miles distant from Calais, the nearest point on the French coast. Dover is an important railway terminus, and as a port for mail and packet service with the continent it has a large passenger traffic. Shipbuilding, sailmaking and fisheries are the chief industries. The harbor has been much improved in recent years, and the entrance is protected by Admiralty Pier, which is nearly half a mile in length. The famous old castle of Dover stands on the celebrated chalk cliffs, 350 feet in height. Dover suffered from air raids and bombardment from the sea during the World War. Population, 1921, 39,985.

DOVER, N. H., the county seat of Strafford County, ten miles northwest of Portsmouth, on the Cocheco and Bellamy rivers, and on branches of the Boston & Maine railroad. There are also interurban lines. The river furnishes water power for manufactures, which include machinery, cotton and woolen goods, lumber products, printing presses and shoes. The city has a public library, a town hall, an opera house and two hospitals. The place was settled in 1623 and is the oldest town in the state; it received its present name in 1639. As a frontier settlement during the seventeenth century, it suffered greatly from Indian attacks. Population, 1910, 13,247; in 1920, 13,029, a slight decrease.

DOVER, Strait of, one of the most traversed bodies of water in the world, is a narrow channel between Dover and Calais, which separates Great Britain from the French coast. At the narrowest part it is only twenty-one miles wide. The depth of the channel at a medium in the highest spring tides is about 150 feet. On both the French and English sides are chalk cliffs, which show a correspondency of strata. Great steel nets were stretched across the strait by the British and French during the World War to check the operations of enemy submarines.

DOW, Neal (1804–1897), an American temperance reformer, born in Portland, Me., of Quaker parentage. Maine's prohibition law was drafted by him in 1851. He served twice as mayor of Portland, and one term as assemblyman, and he enlisted in the Union army during the Civil War, being promoted to the rank of brigadier-general. After the war he devoted himself to the temperance cause, and was the candidate of the national Prohibition party for President in 1880.

DOW'DEN, Edward (1843–1913), an English critic, one of the foremost Shakespearean scholars. He was born in Cork, Ireland, and educated at Trinity College, Dublin. Dowden held successively the positions of professor of oratory and professor of English literature in Trinity College. His writings include *Shakspere: His mind and Art*, *Shakspere Primer*, *Introduction to Shakspere*, with editions of the *Sonnets* and of *Hamlet* and *Romeo and Juliet*, critical works on Shelley and Wordsworth and a history of French literature.

DOW'ER, in law, the right of the widow, so long as she lives, to a portion of her deceased husband's property. In common law it is one-third of such freehold estates of inheritance as the common issue of the marriage might have inherited. In England, Canada and the United States the laws concerning dower have been modified. In some states dower has been entirely abolished.

DOWIE, John Alexander (1847–1907), an American religious leader and faith healer, born at Edinburgh, Scotland. He was admitted to the ministry and was pastor of two churches in Sydney, Australia, but later devoted himself to evangelism, traveling in England and America. He finally settled in Chicago in 1890 and soon afterward organized the Christian Catholic Church, with headquarters at Zion, about forty miles north of Chicago. There he established a publishing house, a bank, a college, many charitable institutions, candy and lace factories and other industries, over all of which, as well as the conduct of his followers, he was dictator. In 1903 a tabernacle was erected at Zion, said to be one of the largest churches in the world. In 1901 Dowie announced himself to be Elijah the Restorer and made plans to extend the influence of Zion's church throughout the world. In 1906, however, a revolt among his followers led to his downfall. He was succeeded by Wilbur G. Voliva.

DOYLE, Arthur Conan, Sir (1859–), an English novelist, best known as the author of the Sherlock Holmes detective stories. Doyle studied at Stonyhurst and Edinburgh, and from 1882 to 1890 he practiced medicine at Southsea. The success of some early attempts at fiction led him to give up his profession for a literary career, and he published a great number of very popular books. In 1887 appeared *A Study in Scarlet,* made famous at once by the detective Sherlock Holmes, whom he introduced also into *The Sign of the Four, The Adventures of Sherlock Holmes, The Memoirs of Sherlock Holmes, The Hound of the Baskervilles* and *His Last Bow.* Among his other books are the historical novels *Micah Clarke* and *The White Company*; the volumes of short stories *Round the Red Lamp* and *The Stark Munro Letters,* and *The Great Boer War.* He was knighted in 1902, as a reward for his services during that war and for his defense of the British policy. During the World War Doyle wrote a *History of the Great War,* the third volume of which appeared in 1918. The same year he published *The New Revelation,* and in 1921 appeared *The Vital Message.*

A. CONAN DOYLE

DRACHMA, *drak'ma,* a unit of weight and of money among the ancient Greeks; also, the name of their principal coin, made of silver and worth about 19 cents. As a unit of weight it varied from 56 to 97 grains troy. The same name is given to a modern Greek coin, exactly equal to the French franc and, approximately to 19 cents. It is divided into 100 *lepta.* The *drachma, dram* or *drachm* is the unit of weight in Greece, being exactly equal to the metric *gram.*

DRA'CO, an Athenian statesman who flourished about 624 B. C. When the citizens of Athens became dissatisfied because they had no written laws to which they could appeal for justice, Draco was appointed to draw up such a code. These first written laws were so merciless that they were said to have been written in blood. Almost every offense was punishable with death. The laws of Draco were replaced later by the constitution of Solon. See Solon.

DRAFT, a written order, in regular form, which commands one party, called the *drawee,* to pay to another party the *payee,* a certain sum of money on a specified date. The person making the draft is called the *drawer.* A *sight draft* is one payable on presentation; a *time draft,* one payable a specified number of days after presentation. When a time draft reaches the drawee (through a messenger) he writes "Accepted" across its face and signs his name below the word. The draft then becomes in fact a note for him to pay at maturity. A *bank draft* is one issued by a creditor (the drawer) requesting the drawee, the debtor, to pay to a bank, for transmission to the creditor, a sum of money. In such case the banks act as agents.

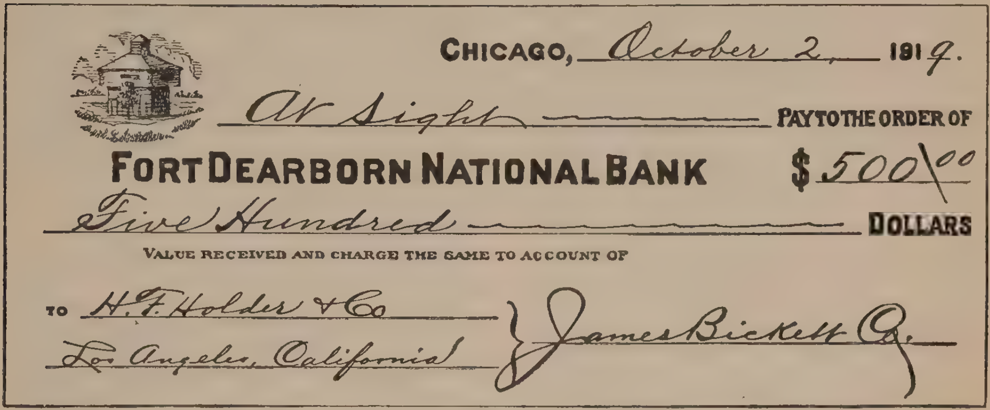
There is no prescribed legal form of draft, but custom has decreed a style similar to the one in the drawing, which illustrates a common case—a person authorizing a bank to collect a debt or an account about to fall due. The bank's charge for collection and transmission of the money is called *exchange*; it may be paid by the drawee, or by the drawer. (See page 1111).

A draft is one kind of a bill of exchange, (which see). See also Check, which is a modified form of draft.

DRAFTING. See Conscription.

DRAG'ON, a name for several species of lizards inhabiting Asia, Africa and South America. The common *flying lizard* is about ten or twelve inches in length, the tail being extremely long in proportion to the body. The sides of the animal are furnished with peculiar extensions of the skin, which form a kind of wings and help to support the animal in the air when it springs from branch to branch. These lizards feed almost exclusively on insects.

Dragons, in mythology, were fierce, winged beasts like huge lizards, breathing fire and preying on human beings.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DRAGON FLY, a family of beautiful insects, with large, gauzelike wings, that give it powerful and rapid flight. The dragon fly lays its eggs in the water, where the larvae and pupae live on aquatic insects. The larval stage lasts for a year. The pupae are always hungry. They propel themselves through the water by drawing it into their bodies and throwing it out again. In the United States the dragon fly is known as the *devil's darning needle,* and is the subject of some childish superstitions, but the dragon flies are harmless insects, and not even the butterflies are more beautiful and graceful.

DRAGON FLY

DRAIN'AGE, a method of withdrawing the water from the soil by means of channels, which are generally covered. Wet lands are made more productive, swamps and marshes are reclaimed and unhealthful surroundings are made sanitary by drainage. Successful drainage in a great measure depends on a proper knowledge of the situation and the porosity and character of the various strata of the soil. Some strata allow water to pass through them, while others force it to run or filtrate along their surfaces till it reaches a lower level. In general, where the grounds are in a great measure flat and the soils retain the excess of moisture, they require artificial drainage to render them capable of yielding good crops.

The wetness of land, which makes it inferior for agricultural purposes, may appear not only as surface water, but as water which flows through the lower strata, and in consequence both surface-draining and under-draining are at times necessary. Open ditches carry off the surface water, but they also carry off much of the best soil, so they are not generally used where other methods are available. Stone or tile drains lying four or five feet below the surface are the best medium for agricultural lands. Stone drains are either formed on the plan of open culverts of various forms, or of small stones in sufficient quantity to permit a free and speedy filtration of the water through them. The box drain, for instance, is formed of flat stones neatly arranged in the bottom of the trench, the whole forming an open tube. In tile drains, tiles or pipes of burnt clay form the conduits. They possess all the qualities which are required in the formation of drains affording a free ingress to water, while they effectually exclude vermin, earth and other injurious substances.

Drainage tiles and pipes have been made in a great variety of forms, but all authorities agree that the cylindrical tile is best suited to all conditions. They are manufactured in all diameters up to about two feet.

Sometimes, by placing a few simple drains in the proper places near the sources of springs, swamps of great extent may be quickly dried, while surface drainage of the swamps would be very expensive and only partly successful. Sometimes laws provide for the reclamation of swamp land, partly at the expense of the county in which they are located. In the laying out of drains, the first point to be determined is the place of outfall, which must necessarily be at the lowest point of the land to be drained. The next point to be determined is the position of the minor drains. In the laying out of these, the surface of each field must be regarded as being made up of one or more planes, for each of which the drains should be laid out separately, so that they will run in the line of the greatest slope, no matter how distorted the surface of the field may be. All the minor drains should be made to discharge into mains or submains, and not directly into an open ditch or water course. As a general rule, there should be a main to receive the waters of the minor drains from every five acres.

Great reclamation projects have had for their purpose the draining of vast areas. The most notable instances in recent years has been in connection with the Everglades of Florida (see EVERGLADES).

DRAINAGE CANAL, CHICAGO, a canal connecting the south branch of the Chicago River with the Desplaines River at Lockport, Ill. It was constructed for the purpose of turning the sewage of Chicago into the Illinois River. Previous to its construction the sewage had flowed into Lake Michigan, from which the city obtains its water supply. It is considered one of the greatest engineering feats of the century. By its construction the Chicago River, which flowed into Lake Michigan, had its direction reversed, and a powerful current from the lake was sent through its channel to the Illinois River and thence to the Mississippi.

This canal was begun September 3, 1892, and was completed in January, 1900, at a cost of about $50,000,000. It is a little over twenty-eight miles long and from thirty to thirty-six feet deep; its width at the bottom in rock sections is 160 feet, and in earth sections from 110 to 202 feet, and at the top it is from 200 to 300 feet wide. The depth of water is never less than twenty-two feet, and the average flow is 300,000 cubic feet a minute, though its capacity is 600,000 cubic feet. The controlling works at Lockport consist of flood gates, a beartrap dam and a tail-race 6,500 feet long. The channel is large enough to carry boats drawing twenty-two feet of water, and with certain improvements in the Illinois and Mississippi rivers the canal will serve the double purpose of drainage and transportation towards the Gulf of Mexico, and may some day form an important link in a Lakes-to-Gulf waterway, which has been discussed for a number of years.

DRAINAGE TUBES are used in surgery to conduct pus away from an abscess when a free incision cannot be safely or conveniently made. They are usually made of rubber or caoutchouc, and are introduced into the abscess or wound so that one end is in contact with the seat of discharge, while the other reaches to the surface of the skin.

DRAKE, FRANCIS, Sir (1540–1596), an English navigator, famed as the first Englishman to circumnavigate the globe. He served as a sailor in a coasting vessel and afterward joined Sir John Hawkins in his last expedition against the Spaniards (1567), losing nearly all he possessed in that unfortunate enterprise. On the most famous of his voyages Drake passed the Straits of Magellan, plundered the coasts of Chile and Peru, sacked several ports and captured a Spanish galleon laden with silver, gold and jewels to the value of perhaps $1,000,000. He then ran north, seeking a passage to the Atlantic, but was compelled to abandon this scheme. He then steered for the Molucca, crossed the Indian Ocean, doubled the Cape of Good Hope and arrived at Plymouth, November 3, 1580, completing a journey around the world. Drake was also one of the heroes of the contest with the Spanish Armada in 1588 (see ARMADA).

SIR FRANCIS DRAKE

DRAKENSBERG, *drah′kens berg,* a range of mountains in Southern Africa, forming the western boundary of Natal and the watershed between the Orange and Limpopo rivers. It is 500 miles in length and has an elevation of from 10,000 to 11,000 feet.

DRAMA, *drah′ma,* a prose or poetic work, usually intended to be acted on the stage, in which, by conversation, action and set scenery, incidents and characters are presented in a striking manner. Its two great branches are tragedy and comedy; in a tragedy the plot is of a serious character and the outcome of the play is gloomy, while comedy has a happy ending. Shakespeare's *Macbeth* is a good example of tragedy, and his *Midsummer Night's Dream,* of comedy. The origin of the drama must be sought for in the love of imitation, and dramatic performances of some kind are to be met with probably among all nations. Dramatic compositions are found in the Old Testament, for example, in *Job* and the *Song of Solomon;* and ancient India and China both developed a dramatic literature of their own.

Recent American Drama. Since the last quarter of the nineteenth century there were produced in America numerous plays by native writers, but comparatively few of high value. One of the most enduring of American comedies is Denman Thompson's classic of rural life, *The Old Homestead.* First produced in 1887, it was played with unfailing success for thirty years. Other playwrights who were active at about the same time include James A. Herne, remembered particularly for his *Shore Acres,* and Bronson Howard, the author of the popular *Shenandoah* and *The Henrietta.* A brilliant and prolific writer, Clyde Fitch (1865–1909), was very successful with plays dealing with contemporary society life, such as *The Climbers* and *The Way of the World.*

Plays of a somewhat serious character, presenting various ethical and social problems, have not been lacking. Examples of this class are *The Easiest Way* and *Fine Feathers,* by Eugene Walter, *Kindling,* by Charles Kenyon, *Bought and Paid For,* by George Broadhurst, *The Servant in the House,* by Charles Rann Kennedy, and *Salvation Nell,* by Edward Sheldon. David Belasco, the theatrical manager, proved very successful both as a writer and as an adapter of plays. A list of his more important works will be found in his biography.

The European Drama. This had its origin in Greece, and here both forms, tragedy and comedy, took their rise in the celebrations of the festivals of Bacchus. At these festivals, hymns and chants, either sorrowful or gay in tone, were sung by choruses in honor of the gods, and the chorus continued to be a prominent feature of the old Greek drama. A distinguishing mark of the Greek drama was its adherence to what was known as the unities of time, of place and of action. That is, the events of the play must not extend over more than one day; any change of scene must be slight, no more than what could actually be accomplished in the length of time represented, and all the incidents must bear closely on the one central plot.

The invention of tragedy is generally ascribed to Thespis (about 550 B. C.); but the true creator of tragedy was Aeschylus. Thespis had only one actor, who from time to time relieved the chorus by declamation; Aeschylus changed this representation into real action by making use of two actors in addition to the chorus. He also introduced masks; and by means of a long gown and the *cothurnus,* or buskin, the lofty stature of the heroes was imitated. A third actor was first introduced by Sophocles. Other changes also took place. The chorus, fifty in number, was divided into four groups, and plays were presented in groups of four, founded upon some one legend.

Greek tragedy, at the time of its chief representatives, Aeschylus, Sophocles and Euripides, was rather a religious function than an entertainment. Not only moral, but religious, purposes were evident, and a fear of the justice of the gods was taught by the presentation of the punishment which followed an evil action. Comedy developed side by side with tragedy, but it never attained an equal importance. Largely political in its origin, it held up to ridicule the most prominent men of the day; and from this phase it passed to the ridicule of the foibles of humanity as a whole. The chorus was dropped from the comedy early in its history. The most important name in connection with Greek comedy is Aristophanes.

The regular drama among the Romans was borrowed from the Greeks. Plautus and Terence were imitators of the Greek comedy, and it is from their translations, rather than from the originals, that we are acquainted with the work of the later Greek writers of comedy. The most important remains of Roman tragedy are the ten dramas accredited to Seneca, which were intended for reading rather than for acting.

In most modern European countries the regular drama took its rise in the mysteries, miracle plays and moralities of the Middle Ages. In Italy, however, it began with a reproduction in Latin of classical models. The earliest tragedy in Italian is Trissino's *Sofonisba* (1515). Regular comedies in Italian were written by Ariosto, Aretino, Macchiavelli and others; and to the same period (fifteenth and sixteenth centuries) belongs the Italian pastoral drama. The pastorals gave birth to the opera, early masters of which, so far as it may be included in the poetic drama, are Zeno and Metastasio. The Italian drama waned in the seventeenth century, but in the eighteenth century genuine comedy and classic tragedy were restored, the former by Goldoni, the latter by Alfieri. Monti, Manzoni and Niccolini are among the later writers of tragedy.

The other European nations cultivated the dramatic art much later than the Italians. The first English comedy, *Ralph Roister Doister,* was published before 1551, while the first tragedy, *Gorboduc,* or *Ferrex and Porrex,* appeared some years later. The history of the English theater and drama is divided into two parts, the first of which begins with the reign of Elizabeth and ends with the reign of Charles I. The rapid development of the drama during the reign of Elizabeth was entirely unhampered by foreign influence. Lyly, Peele, Greene, Marlowe, Shakespeare, Ben Jonson, Beaumont and Fletcher, Chapman, Webster, Middleton, Marston, Ford and Massinger are among the chief names connected with this brilliant period of the English drama. During the Commonwealth the Puritans prohibited all kinds of plays, and the theaters were shut up for thirteen years. With Charles II the drama reappeared and exhibited a licentiousness hardly equaled by that of any other Christian nation. Among the chief names belonging to this period are Dryden, Otway, Lee, Shadwell and Wycherley.

From the close of the seventeenth to the end of the eighteenth century, British comedy was cultivated with much success by Cibber, Farquhar, Congreve and others. As most noteworthy among the dramas of this period, however, must be mentioned Addison's *Cato,* Goldsmith's *She Stoops to Conquer* and Sheridan's *The Rivals* and *The School for Scandal.* Some of the famous poets of the nineteenth century, notably Browning, Tennyson and Swinburne, have written dramas, but much of their work is not well adapted for acting. The knowledge of what may be effectively presented on the stage has become clearer in recent years, and most modern plays are written with a view to their dramatic rather than to their literary value. Of the modern British dramatists the most notable include James Barrie, Arthur W. Pinero, Bernard Shaw, Henry Arthur Jones and John Galsworthy.

Corneille (1606–1684) is looked on as the founder of the drama in France. Racine, Molière, Voltaire, and in later times Hugo, are some of the other distinguished French dramatists. Since about 1820 a new dramatic school has been formed in France, which, departing from the ancient strictness of what is called the classic, approaches more and more to the German or British, or what is called the romantic school. The establishment of this school formed part of the general reaction against the excessive adherence to classic models in literature, the leader in the movement being Victor Hugo. Among the modern French dramatists may be mentioned Alfred de Vigny, Alfred de Musset, Mérimée, Scribe, Dumas the Younger, Sardou and Edmond Rostand.

The German drama is of later birth than any we have mentioned, and for a long time the Germans contented themselves with translations and adaptations from the French. Lessing was the first who, by word and deed, broke the French sway, and he was succeeded by Schiller and Goethe, who rank as the greatest of the modern dramatists. Prominent names in the German drama are Kotzebue, Körner, Schlegel, Tieck, Brentano, Grillparzer, Hebbel, Ludwig, Gutzkow, Freytag, Sudermann and Hauptmann. Ibsen and Björnson are connected with Scandinavian drama, Belgium is represented by the Maeterlinck and Italy by D'Annunzio.

Outline on the Drama

I. FORMS
  1. *Tragedy.*
    a. Subject matter serious or classic.
    b. Language dignified and graceful.
  2. *Comedy.*
    a. Less serious than tragedy.
    b. Treatment somewhat light throughout.
  3. *Opera.*
  4. *Burlesque.*
    a. Depicts dignified and serious subjects of life in a ludicrous manner, or vice versa.
    b. Means of satirical criticism.
  5. *Farce.*
    a. More extravagant and ludicrous than the comedy.
  6. *Mysteries.*
    a. Rude dramas presented at solemn festivals; religious in character.
    b. Object — To strengthen Christian Church
  7. *Moralities.*
    a. Allegorical plays. Moral discourses praising virtue and condemning vice.

II. DEVELOPMENT
  1. *Old Testament.*
    a. Job.
    b. Songs of Solomon.
  2. *India.*
    a. Drama much inferior to Greek or modern European.
  3. *China.*
    a. Dramatic writing extensive, but unknown to other peoples.
  4. *Greece.*
    a. European drama originated in Greece, foremost nation in literature in early times.
    b. Dramas at first were celebrations of festivals of Bacchus, god of wine.
    c. Aeschylus, first writer of Greek tragedy.
  5. *Rome.*
    a. Drama borrowed from Greeks. In a sense imitators.
    b. Became powerful and influenced modern literature more forcibly than did Greece.
  6. *Italy.*
    a. Foundation of the drama as produced by Shakespeare came directly from Italian.
    b. Great periods were during fourteenth, fifteenth and sixteenth centuries.
  7. *France.*
    a. 1684, early school of dramatic writings flourished.
    b. Corneille, Racine and Molière the distinguished dramatists.
    c. 1820, a new school of art was formed, called the romantic.
    d. Writers in this school, Sardou, Dumas, Rostand.
  8. *Spain.*
    a. The drama flourished at the same time as the English.
  9. *England.*
    a. Last half of the sixteenth century marked the height of the most brilliant period of the English drama. Writers — Jonson, Marlowe, Shakespeare.
    b. Theaters were shut up for thirteen years by Puritans.
    c. With Charles II the drama reappeared.
  10. *German.*
    a. At first merely translations from the French.
    b. Original works appeared later on.
    c. Schiller and Goethe greatest of modern dramatists.

Related Articles. Consult the following titles for additional information:

GENERAL

Burlesque
Camille
Comedy
Comic Opera
Farce
Figaro
Hamlet
Macbeth
Masque
Melodrama
Midsummer Night's Dream
Miracle Plays
Morality Plays
Mystery
Opera
Passion Play
Theater
Tragedy

DRAMATISTS

Ade, George
Aeschylus
Alfieri, Vittorio
Annunzio, Gabrielle d'
Aristophanes
Barrie, James, Sir
Beaumarchais, Pierre Augustin Caron de
Beaumont, Francis and Fletcher, John
Belasco, David
Boucicault, Dion
Congreve, William
Corneille, Pierre
Dryden, John
Dumas, Alexander
Euripides
Fitch, Clyde
Galsworthy, John
Gilbert, William S.
Goethe, Johann
Goldsmith, Oliver
Halevy, Ludovic
Hauptmann, Gerhart
Herne, James A.
Ibsen, Henrik
Jonson, Ben
Lesage, Alain R.
Maeterlinck, Maurice
Marlowe, Christopher
Molière
Pinero, Arthur Wing
Plautus, Titus M.
Racine, Jean
Rostand, Edmond
Sardou, Victorien
Schiller, Johann F.
Shakepeare, William
Shaw, George B.
Sheridan, Richard B.
Sophocles
Strinberg, August
Suderman, Hermann
Synge, John Millington
Terence
Thomas, Augustus
Udall, Nicholas
Vega Carpio, Felix Lope de
Yeats, William B.

ACTORS

Adams, Maude K.
Anderson, Marie A.
Anglin, Margaret
Arthur, Julia
Barrett, Lawrence
Barrymore (family)
Bernhardt, Sarah
Booth, Edwin Thomas
Cohan, George M.
Coquelin, Benoit C.
Irving, Henry, Sir
Jefferson, Joseph
Keene, Laura
Langtry, Mrs. Lillie
Mannering, Mary
Mansfield, Richard
Mantell, Robert
Marlowe, Julia
Modjeska, Helena
Morris, Clara
Cushman, Charlotte S.
Drew, John
Duse, Eleanora
Elliott, Maxine
Fiske, Minnie Maddern
Forbes-Robertson, Johnston, Sir
Forrest, Edwin
Garrick, David
Gillette, William H.
Goodwin, Nathaniel C.
Hackett, James K.
Herne, James A.
Illington, Margaret
Nazimova, Alla
Rachel
Ristori, Adelaid
Russell, Lillian
Salvini, Tommaso
Siddons, Mrs. Sarah
Skinner, Otis
Sothern, Edward H.
Terry, Ellen A.
Thompson, Denman
Tree, Herbert Beerbohm, Sir
Warfield, David

DRA'PER, ANDREW SLOAN (1848–1913), an American educator, born at Westford, New York. He first distinguished himself in the field of politics, serving in the New York legislature and as a member of the Court of Commissioners of the Alabama claims, by appointment of President Arthur. His chief service, however, was in the interest of education. He was largely instrumental in securing the erection at Albany of the educational administration building, one of the most exquisite modern examples of classic Grecian architecture. In 1886 he was elected superintendent of public instruction of New York and retained the position for six years, when he became superintendent of schools in Cleveland, Ohio. He was president of the University of Illinois from 1894 to 1904, and afterwards was commissioner of education for the state of New York. He was the author of *American Schools and American Citizenship, American Universities and the National Life,* and *Organization and Administration of the American School System.*

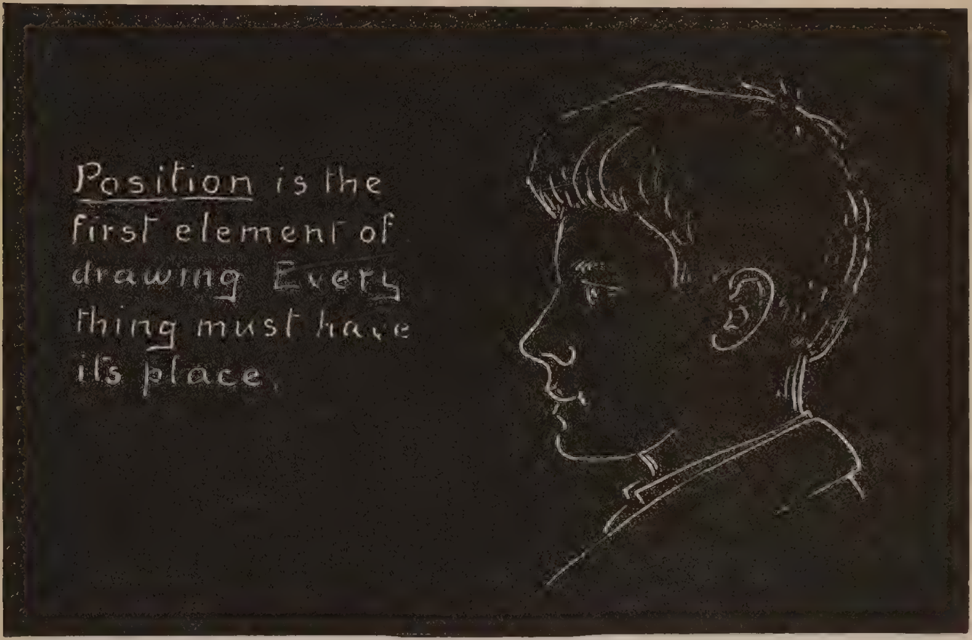
DRAVE, a European river which rises in Tyrol, flows across the northern part of Illyria and the southern end of Styria, between Hungary on the left and Croatia and Slavonia on the right, and joins the Danube fourteen miles east of Essek. Its chief affluent is the Mur. It is about 450 miles long, and is navigable for about 350 miles.

DRAVID'IAN, a term applied to the vernacular tongues of the great majority of the inhabitants of Southern India and to the people themselves, who must have inhabited India previous to the advent of the Aryans. The Dravidian languages are generally considered to belong to the Turanian class.

DRAWING, the art of representing upon a flat surface the forms of objects and their positions and relations to one another. Drawing is a mode of expression. It is as natural to the child as writing and is used by him long before he learns to write, and in many instances even before he learns to talk. Experienced teachers of drawing claim that were drawing taught with as much care and persistence as language in the primary grades of the public schools, the children would go from these grades as proficient in one mode of expression as in the other.

Importance of Drawing. The practical value of ability to draw even simple objects is almost beyond estimate, let one's occupation be what it may; while to those engaged in the occupations of carpenter, blacksmith or dressmaker, and in other common occupations requiring mechanical skill, a knowledge of drawing is indispensable. Notwithstanding this, how few can draw even the simplest designs. The common expression, "I can't draw a straight line," is in most cases more real than imaginary. Whoever goes into life without knowing how to draw is handicapped in his ability to express himself. Ability to draw also enables one to make plain many things which cannot be explained by words alone, as the description of a machine or the plan of a house. Moreover, a knowledge of drawing gives a person a knowledge of form and size which enables him to judge machines, tools, houses and other structures more accurately than is possible without such knowledge; it gives him an insight into the beauties of form and structure in the various objects of nature—as rocks, flowers, insects, birds and animals, and this contributes much to his enjoyment of the works of creation. From any point of view, the man or woman who can draw has great advantage over one who cannot.

Considering the importance of drawing, we often wonder why so few people are able to draw even the simplest objects, and when we compare the results derived from teaching drawing in the public schools with results from teaching other branches, we find the comparison anything but encouraging. Doubtless the chief reason for the failure to secure good results in drawing lies in the fact that drawing has not been, and in general is not yet, taught as systematically as are the other branches in the courses of study. This does not mean that regular lessons in drawing have not been given, but it does mean that underlying principles have not been presented and drilled upon as they are in the teaching of arithmetic, language and other common branches. Where this is done the children learn to draw as readily as they learn writing, language or other subjects. It is the purpose of the exercises on the following pages to illustrate how drawing can be taught systematically and how anyone who so desires can learn to draw.

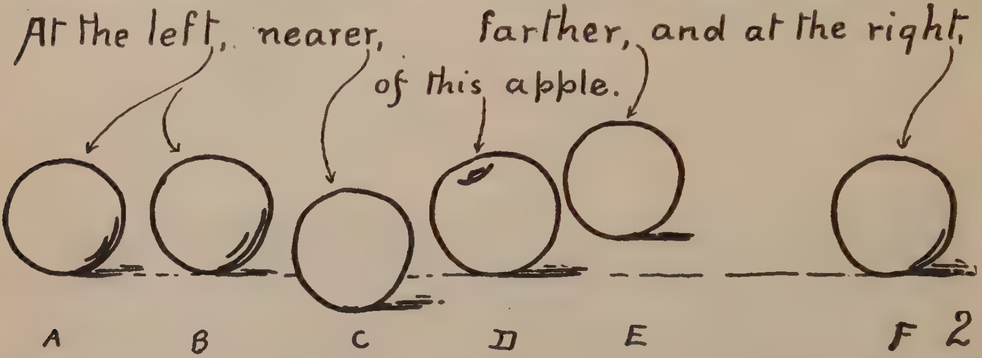

Position is the first element of drawing Every thing must have its place.

Elements of Free-Hand Drawing. The fundamental elements of free-hand drawing are:

Position, or the placing of objects,
Direction, or the surface of objects,
Form, or the shape of objects, and
Proportion, or the size of objects.

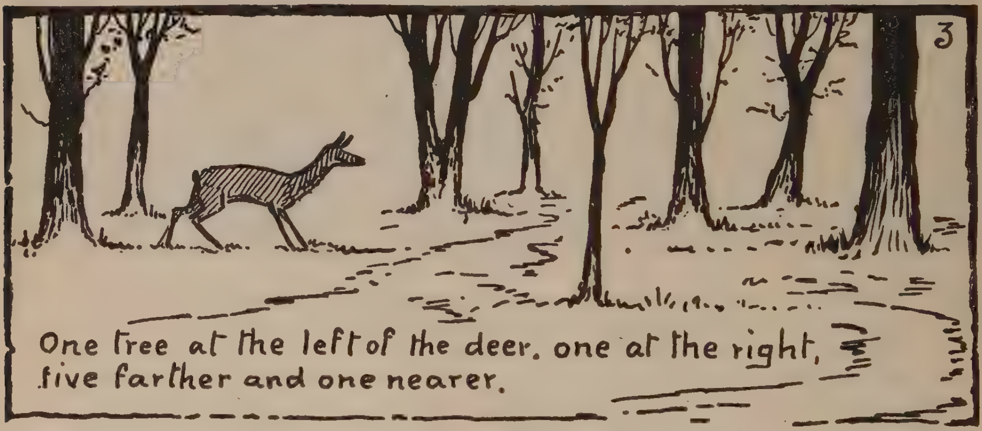
These elements are mechanical and can be taught by all teachers and learned by practically all pupils. They are to drawing somewhat as addition, subtraction, multiplication and division are to numbers. Through them the fundamental processes of drawing are taught and learned.

To these may be added the esthetic element, which in drawing is called the artistic or character element. This element is gained largely through absorption. The artistic cannot be taught in the direct manner of the mechanical elements, but is gained more slowly as the principle and the mechanical processes are learned. As the fundamental elements or processes are taught, the esthetic element is absorbed to a greater or less degree, according to the temperament of the pupils.


At the left, nearer, farther, and at the right, of this apple.
A
B
C
D
E
F

2

Position. Position tells how to place objects in the picture or drawing. From the first, position deals with one object or a part of an object in relation to other objects. If two apples or three balls are drawn, each must have its place; and in advancing to higher levels, it is groups of objects and things, groups of animals, groups of boys and girls, forms of hills, dales, plains and trees, which must have their position in the picture. Position includes perspective and composition. *Position* shows how to put objects in a definite place; *perspective,* how to place them different distances away, and *composition,* how to arrange them in a pleasing group. In Fig. 1 each part of the head, eye, nose, mouth, chin, ear and hair has its place.



3

One tree at the left of the deer, one at the right, five farther and one nearer.

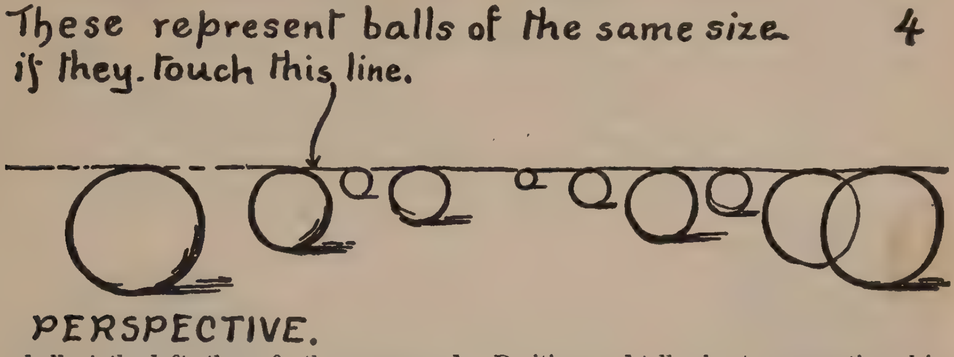
If one wishes to learn how to draw the human head, the first lesson would deal with the placing of each part.

General Principles. In Fig. 2 there are five balls and one apple. Ball F is at the right of the eye. Balls A and B are at the left of the apple. The apple and balls A, B and F are the same distance away (back). Therefore: Objects on the same horizontal line are the same distance away. Ball E is farther away than the apple; ball C is nearer than the apple. The farther away the object, the higher it rests in the picture; the nearer the object, the lower it rests in the picture.

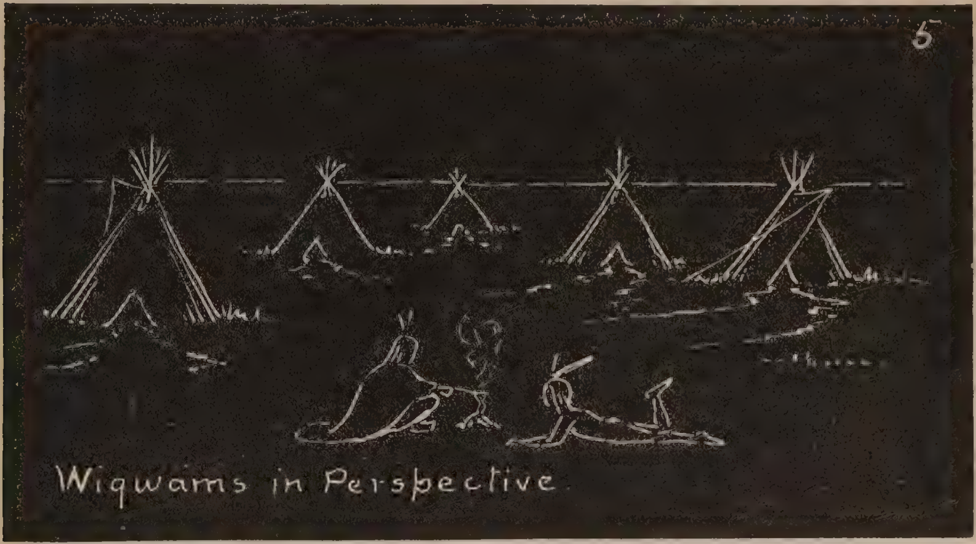
It will be seen from the above that the element *position* has four principal directions from a given point: To the right, to the left, farther, and nearer than the apple, or any given point.

The best objects with which to learn placing are apples and balls. The apple is the center, and the balls are to be placed right, left, farther and nearer, following definite exercises.

Work out such exercises as these: Draw an apple. Place one ball at the right and two farther away. Draw an apple. Place one ball at the left, three farther away and one nearer. Work out about twelve exercises of this nature.


These represent balls of the same size if they touch this line.
4
PERSPECTIVE.

Use models. Progress is more rapid with models than without. Round objects, such as apples, balls or oranges, may be used. The use of the model is to verify what you learn in the drawing. You need not draw from the model, but use the models to verify or prove your drawing.



After some power is gained in placing the balls and apples, then other objects may be used, as, for example, the deer and trees in Fig. 3. Here the deer takes the place of the apple as a center, and the trees are placed right, left, farther and nearer.

Croquet balls and a stake, one black marble and a number of lighter ones, a tree trunk and apples, pears or other fruit, all make excellent models with which to learn placing.

Perspective. Perspective is a branch of Position, and tells about representing objects different distances away.

The simplest way of teaching and learning perspective is arbitrarily to represent the top or a definite part of the object as being level with the eye. This level of the eye is indicated by a light horizontal line, as shown in Figs. 4 and 5.

The method gives perfect perspective, and by using it one learns perspective to the extent that objects near and far away can be represented with ease and with a fair degree of accuracy. The process is as follows:

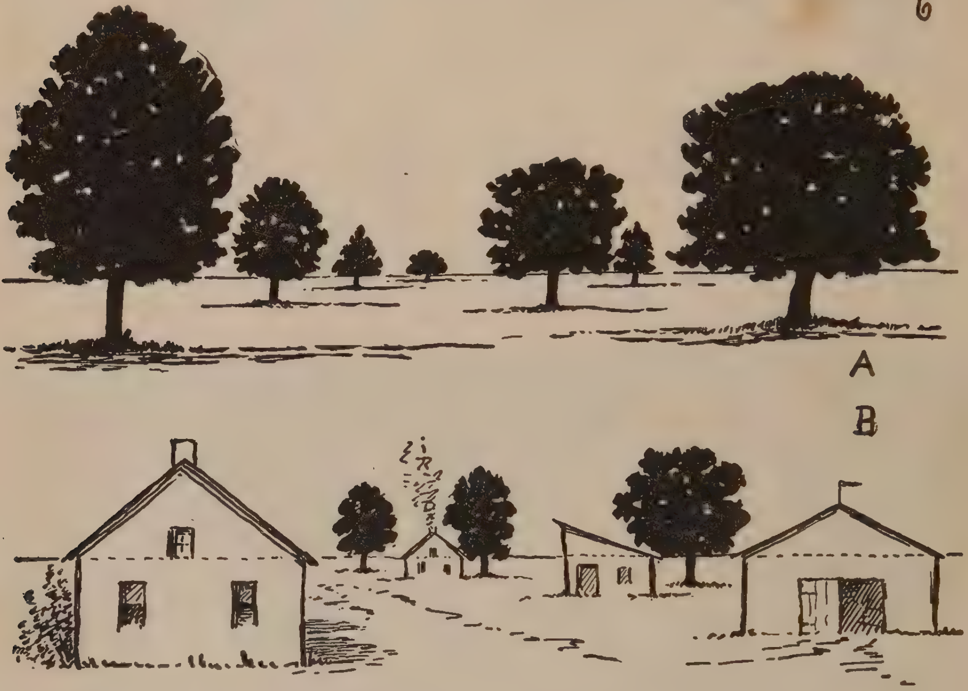
Draw a light horizontal line, as in Fig. 4. This line represents the level of the eye and is called the horizon line.

Draw balls of various size, making the upper edge of the balls touch the horizon line. Then it makes no difference how large or how small the balls may be drawn; they are in perfect perspective. The line under the ball indicates the surface of the ground and marks the position of the ball. The balls are in reality the same size, the farther ones being drawn smaller because farther away.

Use heavy lines for the nearer balls and lighter lines for those farther away.

Make the nearest ball about one inch in diameter on paper, and on the blackboard about five inches in diameter.

b



PERSPECTIVE — Place the roofs and tree tops above the horizon line, and the tree trunks and main part of the houses, below.

Use balls when studying a principle. Why? Because balls are easy to represent, and have so little personality that the attention is not attracted to them sufficiently to lose sight of the more important element, principle. But the same principle is applicable to other objects in the same manner as to the balls. In Fig. 5 are wigwams. By placing the top of each even with the horizontal line, perfect perspective is represented.

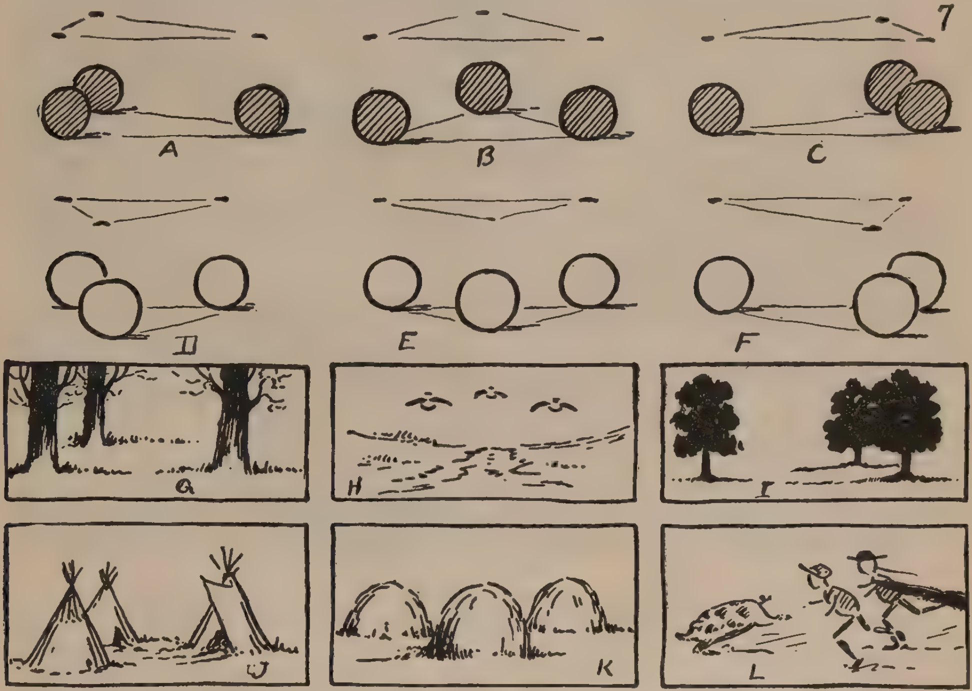
When drawing tall objects, like trees and houses, part may be placed above the horizon line and part below. In A, Fig. 6, the tops or foliage part of the trees are drawn above the line and the trunks below. The trunks are of the same length. In B, the main or rectangular part of the houses are drawn below the horizon line, and the roof or triangular part above the line.

In B, the farthest house has a tree at the right of it and one farther away. Objects may be placed at the right, left, farther and nearer than a given object, the same as in placing.

To learn perspective one may draw such exercises as the following: Draw six balls various distances away. Draw five trees various distances away. Draw four houses. Work such exercises as these until you have acquired the skill necessary to represent objects various distances away.

Of course, using the horizon line is a means of learning perspective; in nature objects are not cut by the horizon line like this, but after you have learned how, then the irregularity of nature may be taken into consideration.

Composition. Composition is the arrangement of objects in a pleasing group. The most simple, pleasing arrangement is triangular. In A, Fig. 7, is a triangle and below it are three balls, one on each angle of the triangle, and still lower down; in G, are the trunks of three trees arranged in the same manner. In like manner, B, C, D, E and F show the different arrangement of triangles; under each triangle are the balls grouped in the same manner, and below these is a composition illustrating the group. Thus, group H corresponds to B; I, to C; J, to D; K, to E; and L, to F.



7

COMPOSITION—A simple grouping of three objects.

Grouping may be learned by composing such exercises as these: Make a group of trees based on triangle A, triangle B, triangle C, and so on.

Direction, or the Surface of Objects

Direction. Direction tells about the surface of objects and the various lines that indicate surface.

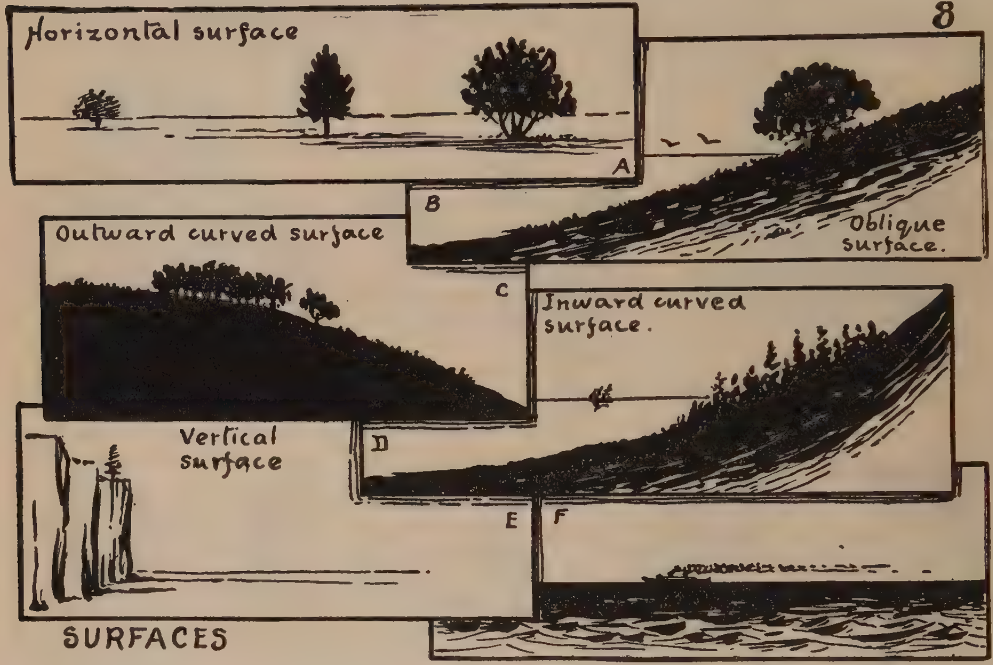
Direction also indicates action—the action of growth as seen in growing plants; the action of inanimate form as seen in the movements of animals, and the action of rhythm as seen in graceful movements.

Direction is indicated by lines. It is the office of a line to show direction. A vertical line indicates a vertical direction or surface; a horizontal line, a horizontal direction or surface; an oblique line, an oblique direction or surface, and a curved line, a curved direction or surface.

The principal directions that lines may take are, therefore, vertical, horizontal and oblique, and are indicated by the vertical, horizontal and oblique straight and curved lines.

In A, Fig. 8, the trees rest on a horizontal surface indicated by the horizontal lines; also in F the horizontal horizon line suggests the horizontal surface of the water. In B the single tree rests on an oblique surface suggested by the oblique line of the slope. In E the vertical lines of the cliff suggest their vertical surface. C represents an outward curved surface and D an inward curved surface. The representation of surfaces may be learned through such exercises as these: Draw an apple resting on a horizontal surface; on an oblique surface; on an outward curved surface; on an inward curved surface. In like manner represent other objects on the various surfaces.

Lines. In Fig. 10 are shown the lines used in drawing. Of the above lines, the first group, the unaccented lines, are learned first. These should be learned before the accented group is taught at all. In general, use the heavy lines in the placing of objects, and the light and medium lines in perspective.



8

SURFACES

The *graded line* is the most important line used in drawing. It is the most rapid, the most serviceable, and the most pleasing of all the lines. This line should be learned, however long it may take, or however great the exertion put forth in learning it. Learn to draw it from light to heavy, or from heavy to light, at pleasure.

In Fig. 11 are examples of the graded line which show how much may be accomplished at each stroke. Observe that the stems are made with a single stroke, and that the joints are represented by a space. Practice these lines until learned.

The *emphasized line* is a line accented by drawing one or more lines parallel and close to it, in such a manner that the general effect is that of one line or direction. Important lines and round surfaces should be emphasized.

The *broken line* is to indicate a broken surface, such as the roughness of ground, the irregularity of grass, the broken appearance of stone, or the bark on tree trunks. Both the broken and emphasized line may be and usually are graded.

All that is truly great comes to us by slow degrees. It is the same in acquiring these lines. There is the least character in the unaccented lines, and the most in the accented; hence these latter are more gradually acquired, and of these the broken line seems to be the last one to be learned.

The different lines should be learned so well that they can be used at any time and in an almost automatic manner. Lines are the words of the drawing language. If they are not learned, they cannot be used, or if learned imperfectly, their use will be labored and imperfect. Learn these lines, and learn them now.

The birds' nests in Fig. 12 are examples of the broken line. The broken line is learned largely through the copy.

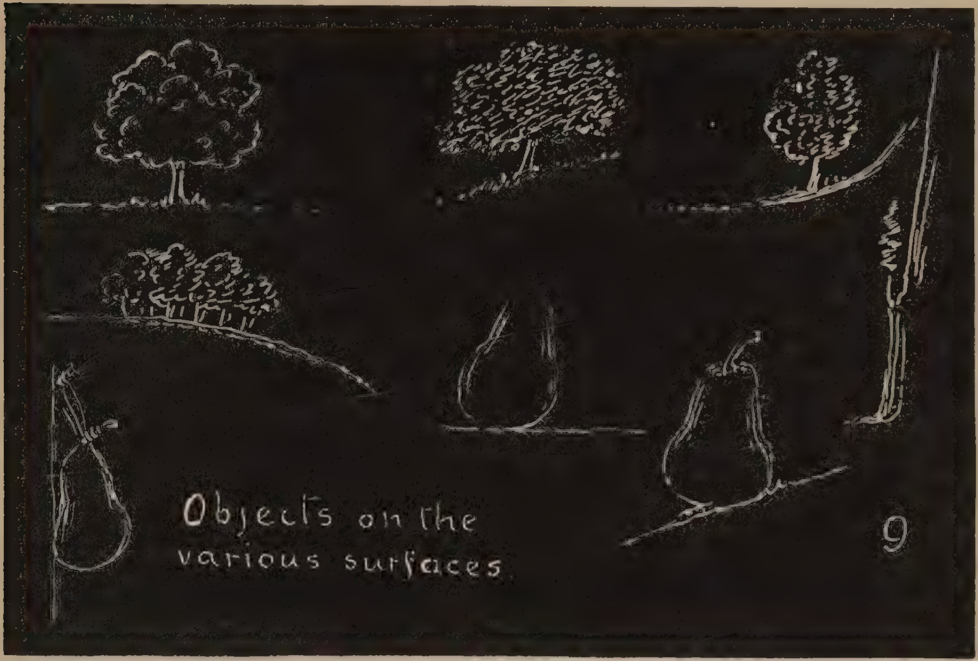
Action Drawing. Action is that part of direction that relates to motion. In a general way direction implies motion, and motion in drawing is largely indicated by lines.

Lines not only express action, but each line has a leading expression of its own that is of vital and far reaching use in action drawing. These expressions are as follows:

Vertical lines are the "still" lines. They express stillness, but when in motion the express vertical motion, as seen in falling water, rain and snow.

Horizontal lines are the "sleep" lines, and suggest repose; but when in motion they express horizontal motion, as in ripples in still water.

Oblique line are the "go" lines, and express movement more than any other kind of line.


Objects on the various surfaces
9

Curved lines are the "grace" lines. They express graceful movement and harmonious action.

Parallel lines are the "order" lines. They express order. When the hair is combed, the lines are made parallel. Parallel lines when in motion express uniform motion.

Angular lines are "discord" lines. They are the lines of disorder and express violent action, as in explosion; awkward action, as in clumsy movement; and disorder, as in untidy hair.

Method of Teaching Action. Action is taught through the copy. It is practically impossible for the average draughtsman to learn action through the object that expresses the action. There is not a movement of an object, or animal, so slow that it can be grasped by a learner to the extent that he can transfer it to paper; hence, first efforts, at least, in the learning of action should be from the copy. An excellent plan is as follows:

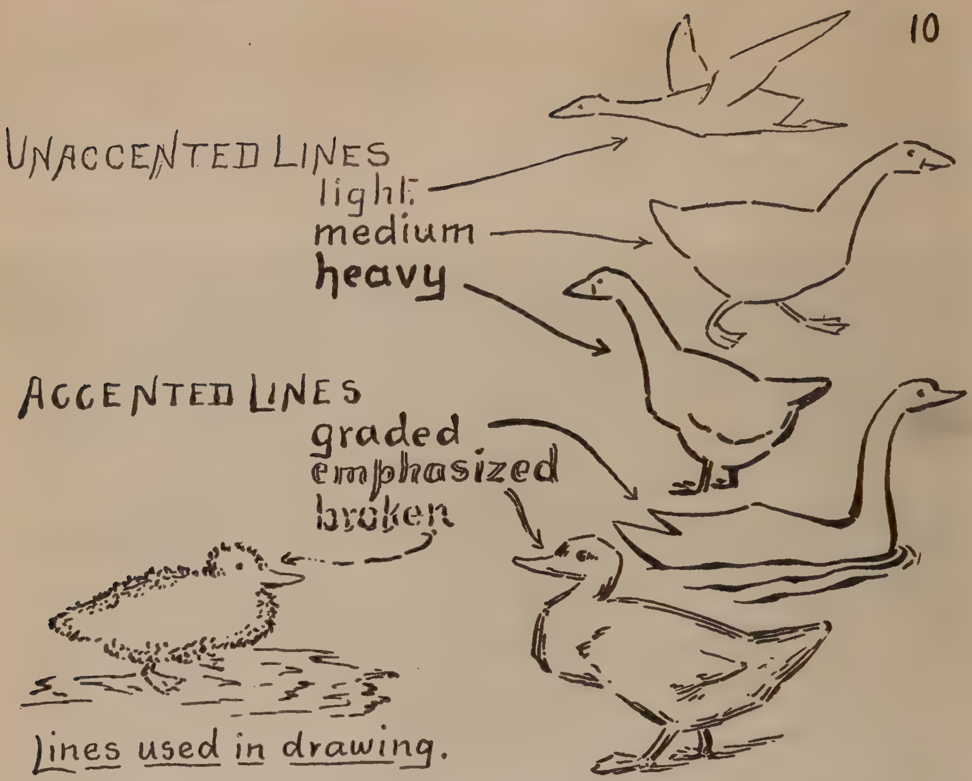
First: Learn how to express the action from the copy; that is, learn the mechanical process—the lines that represent action and the method of using them.

Second: Use the action thus learned in memory and imaginative work until the action can be represented with some degree of facility.

Third: Use direct observation to verify, correct and perfect the action until it can be represented with both facility and accuracy. These three steps are not widely separate, but may occur in the same lesson.

For example, we will choose the action of running. There are many phases of running, but perhaps that represented in A, Fig. 14, is as simple as can be made. Learn this action by carefully copying A, and then for practice, draw an Indian boy running, B; then a Chinese boy, C; a sailor boy, D; and a soldier boy, E.

Then take another phase of running, as shown in F. In this phase the knee joint is represented by a space. A space can represent an idea as well as a line. To learn this, first carefully copy the action; then represent a summer boy, F, running; then a



Lines used in drawing.

winter boy, G; then a colonial boy, H, and so on until the action is learned.

Action is impersonal, that is, it is not a part of the object that expresses the action. Character belongs to the object, to the individual; character and action we often think are one and the same. The action of running is common to all animals alike, but the character of the run belongs to the individual. For example, the running of a turkey, a goose, a hen, a dog, a cat, and a squirrel are in principle the same, but the character of the run is so different that we recognize each one at a glance.

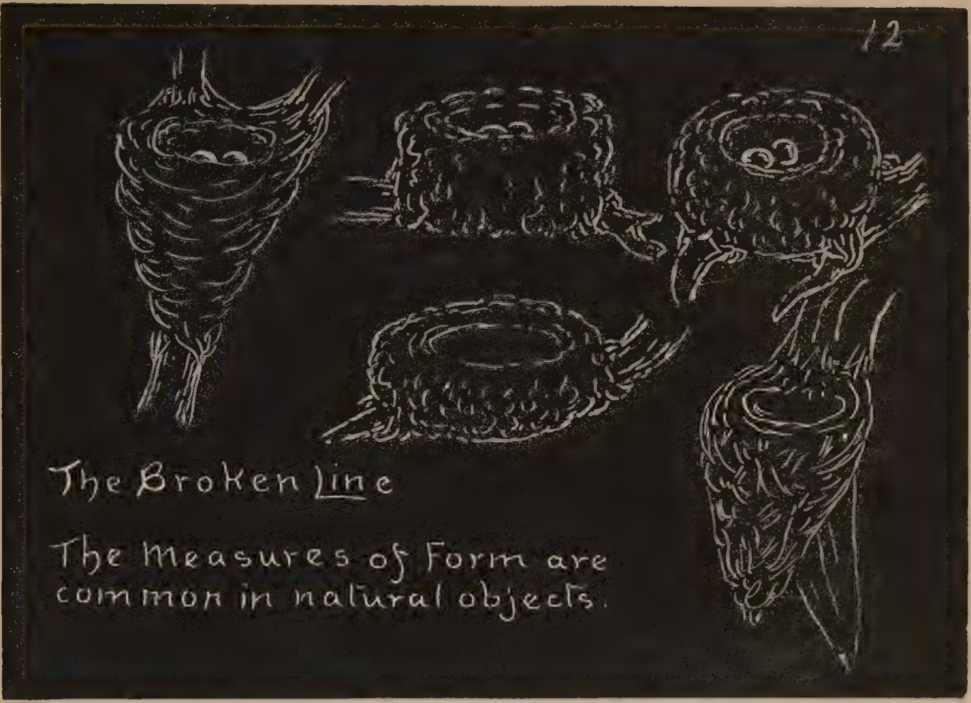
In Fig. 15, A represents the action of running; in C it is applied to an ostrich, in D to a goose, in E to a hen. Then, by taking the two hind legs as one, and the two fore legs as one, the same action is applied to a deer, a horse, a pig and a dog.

Broadly speaking, there are five great groups of action, under which nearly all phases of action may be placed. They are the running group, the walking group, the standing group, the sitting group and the reclining group. Dancing and jumping would be classed under the running group.

In the running and walking groups, the "go," or oblique, lines predominate; in the standing group, the "still," or vertical lines, predominate; in the reclining group the horizontal lines predominate, and in the sitting group the vertical and horizontal lines unite. The "grace," or curved lines, would predominate in dancing, "order," or parallel lines, in the marching of soldiers, and angular lines in a fight.

The Action of Rhythm. Lines not only show direction, and suggest motion, but they may represent rhythm. Rhythm is graceful motion, and in drawing is indicated by graceful lines. All nature is full of rhythm. We see it in the waving grain and bending trees, in the motion of water and the swirl of smoke, in the markings on the feathers of birds, and in the graceful folds of drapery. It is seen in the movements of a kitten and in the color of a lily; it is heard in the call of a lark and in the grand roll of thunder. It is all about us. It is in the graceful or rhythmic motion of sound, color and form.

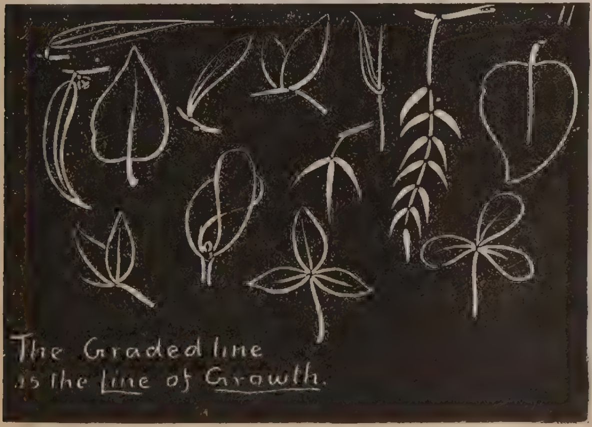
Rhythm finds its expression in skill, in rhythmic skill. Rhythmic skill is doing things easily, quickly and gracefully. Decorative


12
The Broken Line
The Measures of Form are common in natural objects.

design is that department of drawing which deals with the ornamentation of forms, and has for its basis rhythmic skill.

A good way to acquire rhythmic skill is through two-handed drawing on the blackboard. Fig. 18 shows the method, and Fig. 17 shows some excellent examples to practice.

Decorative Design. Decorative design relates to the ornamentation of form, and the designing of form in which the decorative element is primary. In Fig. 19 are represented the line elements in decorative design.


11
The Graded line is the Line of Growth.

The single and double curves are to modify form, as for example, in Fig. 20, A is a rectangle; in B, C, D, E, F and G, the single curves, both inward and outward, are substituted for the vertical lines of the rectangle; and in I, J, K, L, M and N, the double curves have been substituted.

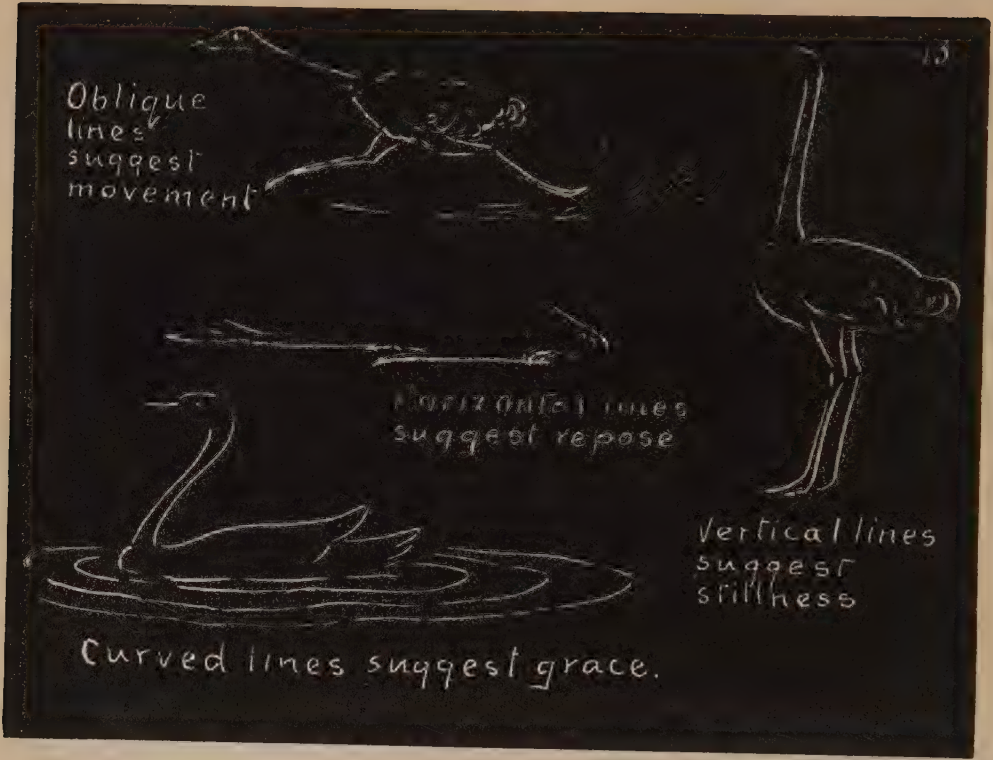
An inward double curve is one that curves in at the top, and an outward double curve is one that curves outward at the top.

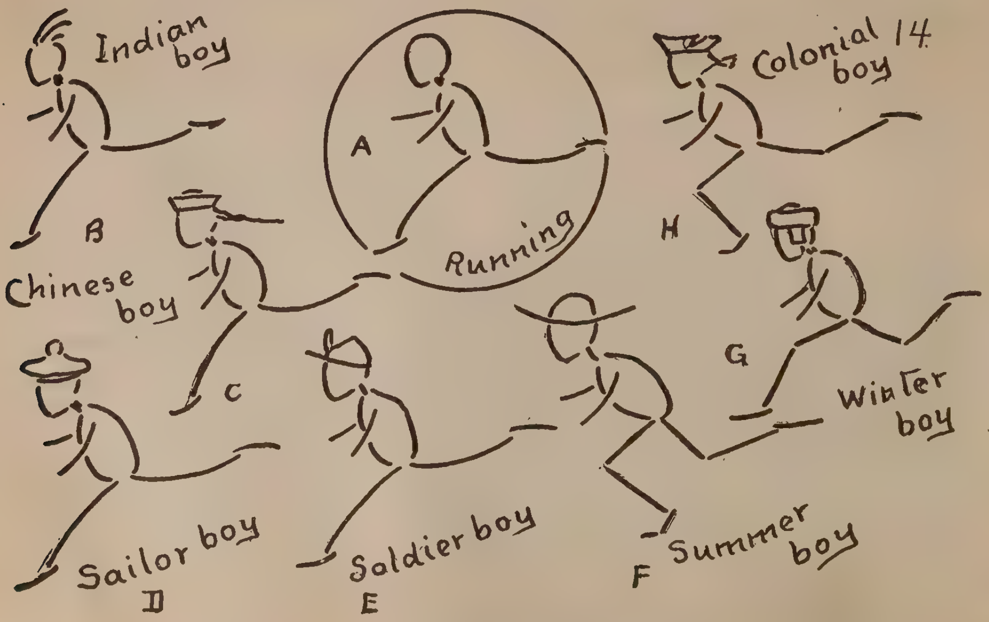
O, P, Q, R and S are pitchers made from the above forms.

Branching is of two kinds—outward and inward. Outward branching is the branch curving outward from the main stem, as A, Fig. 21. The shorter curve is the branch. Inward branching is the branch curving inward toward the main stem, as B, Fig. 21.

D is an example of inward branching, and all the others are examples of outward branching.

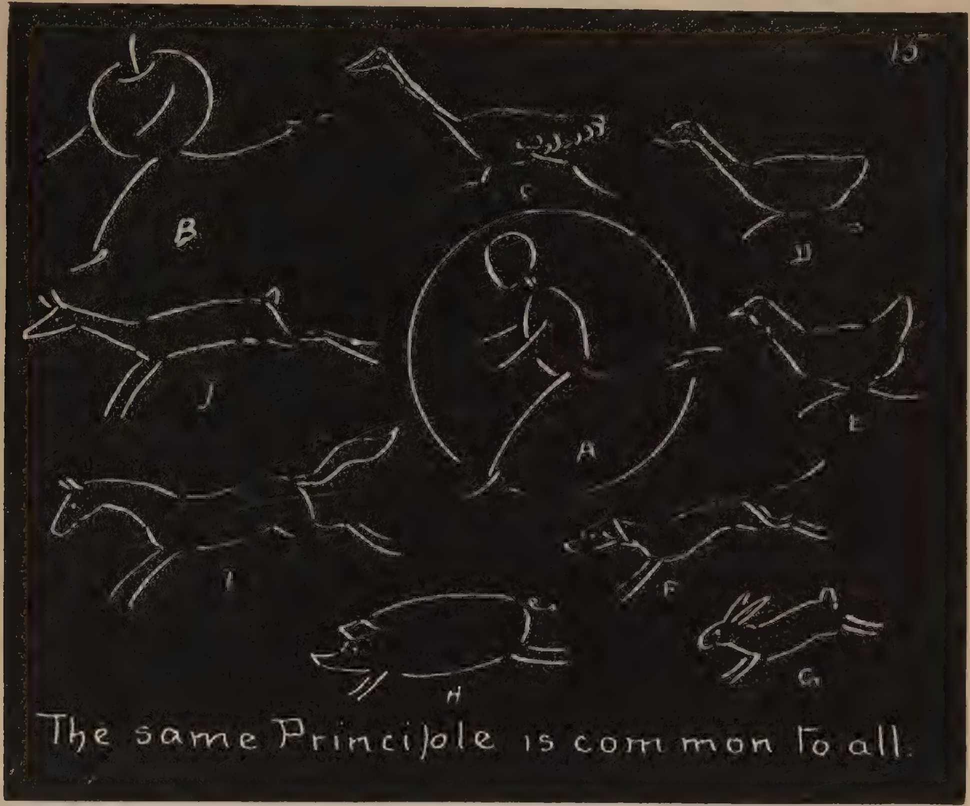
These branching elements are fundamental in character, and are the basis of an infinite number of combinations running through the entire subject of decorative design. To draw these curves and branches


13
Oblique lines suggest movement
Horizontal lines suggest repose
Vertical lines suggest stillness
Curved lines suggest grace.



The Action of Running

with facility requires much practice and persistent effort, but so important is it that these elements be acquired, that almost any amount of application and hard work is justifiable in their acquisition. The designer must acquire the ability to draw these curves and branches with ease, freedom and skill.



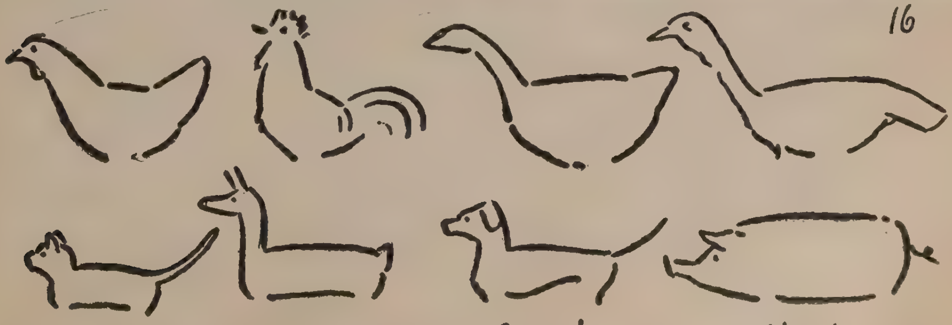
The same Principle is common to all.

Fig. 22 represents the chief form elements used in decorative design and the three ways of applying them. The geometrical forms are the same as those used as measures of form. These forms are used in the planning of ornaments, and as form measures in making designs. The use of these forms is shown in the following discussion on form:

A unit in decorative design is one of the parts used in making the design.

The sources of units are as follows:

The geometrical forms, such as the triangles, rectangles, circles, ellipses and ovals.

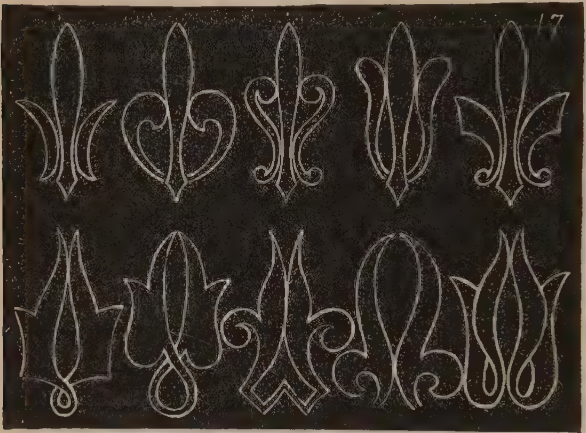


Make these birds and animals run, walk, stand, and sleep.

Plant forms such as the branch, stem, leaf, bud, flower, fruit and root of any kind of tree, shrub or plant.

Animate forms, as the head, body, legs, tail and product of all kinds of animals, birds and insects, fish and reptiles.

Natural forms, as water, snow, ice, icicles, waves, running water, smoke, clouds and wind, shells and minerals.



Artificial forms, such as ribbons, flags, streamers, banners, ropes, chains—in fact, any object made by man.

It will be seen from the above that it is quite impossible to give even a superficial list of the units that may be used. Yet, while this is true, there are certain elements common to all decoration that have their origin in the experience of the past, and have been handed down to us as the fruit of successful experience.

These elements, as near as possible, have been reduced to their most simple form in the five standard units, A, Fig. 23. These units are the result of many years of research and study, and include nearly all the elements used in historic ornament and modern decoration.

These units are so fundamental in character that through them we can learn to use any unit or form, however varied or complex it may be.

These standard units are very similar in their construction, and have elements that are common. The two main lines of each are examples of outward branching.

Carry the point A of the blade around farther, and the trumpet is formed. Carry it still farther and the whorl is formed. Eliminate the point entirely and the loop is formed. Add to the blade another point and the shoulder is formed.

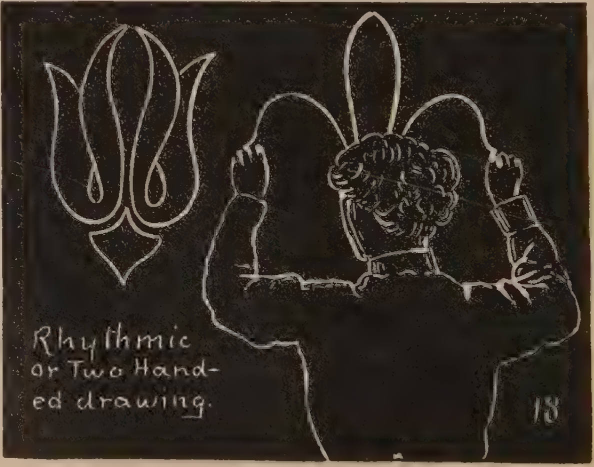
The names of the standard units are given from a real or fancied resemblance to the object after which they are named.

These units are classic, and therefore universal in their application. They can be applied to centers, borders, bands, flat patterns, covers, supports, or any other form of decoration. They will be used throughout this course; therefore they must be fully memorized. We must know them as a carpenter knows his tools.

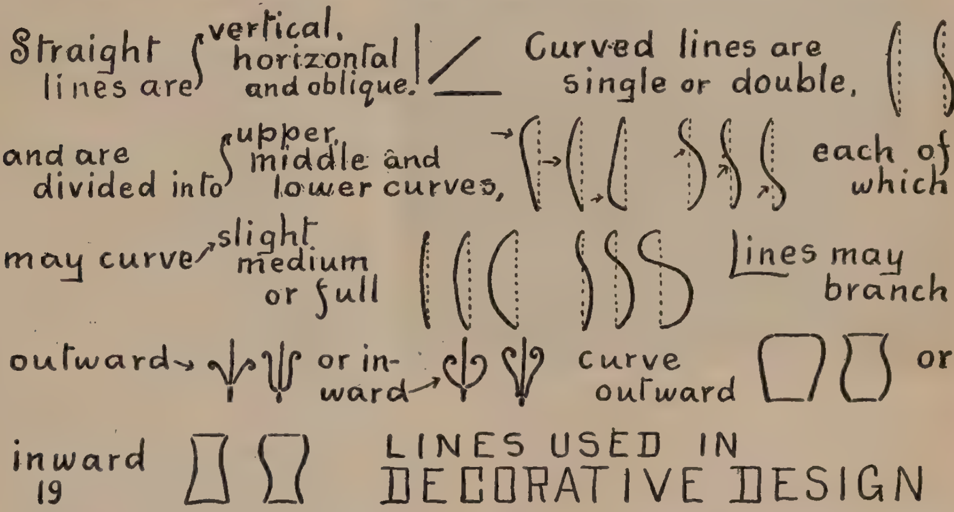
The combinations of these standard units are practically unlimited. Their elements enter into nearly every form of decorative design.

They can branch outward, as in A, Fig. 23; branch inward, as B; branch inward with double curves, as D; and outward with double curves, as C. In Fig. 24, the loop is shown in each of these branchings. Fig. 24 represents the Greek anthemion. The standard units can be combined, as shown in Fig. 25, forming wing units. The first and second rows represent the blade united with each of the standard units. In like manner each standard unit may be united, thus forming endless combinations.

The standard units, the single and double curves with their inward and outward branchings, and the geometrical forms are together a complete set of tools with which



to work in decorative design. They are decorative words to express decorative thoughts, figures of design to work out problems of ornamentation. They are servants of the mind, and as such the greatest liberty may be taken with them; they may be added to, subtracted from, multiplied, divided, or modified in any way the mind may devise. There are no more elements to be given; the list is complete. All that now remains is to make these tools our own until they become willing and obedient instruments in our hands. They have infinite use, and can be applied to all decoration.



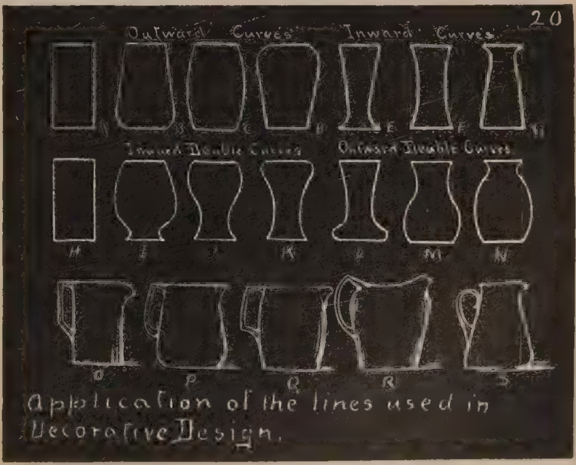
Form

The Measures of Form. Form tells about the shape of objects. The most simple forms that can be seen, recognized and named are the triangles, rectangles, circles, ellipses, and ovals. These forms in mathematics are called geometrical forms, and in drawing, type forms; but a still better name is measures of form, for their use in drawing is to measure form. They are the standards, or measures, of form, very much as a pound is a measure of weight; a gallon, of liquid, or a dollar, a measure of money.

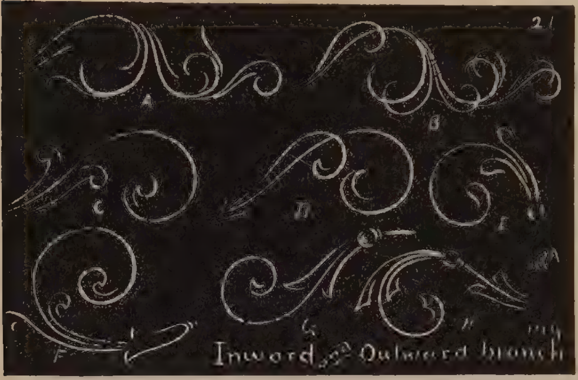
The circle can be modified only in size, but the remaining measures of form may be made narrow, medium and wide, as shown in Fig. 26. The triangle may be drawn with the apex pointing upward or downward, as in A. The rectangle may be vertical, as in C, or horizontal, as in D. A vertical rectangle is one longer vertically, and a horizontal rectangle is one longer horizontally. Ellipses may be drawn vertically and horizontally, as in E and F. The oval may be inverted. There are other modifications, but these are the ones mostly used in the measures of form.

Right means *straight; acute* means *sharp;* and *obtuse, dull. Tri* means *three,* hence *triangle* means a *three-angled figure. Rectus* means *right,* hence, *rectangle* means a *figure composed of right angles. Apex* means *top; base, bottom,* and *altitude, height.*

The uses of measures of form are to aid in recognizing and grasping the shape and proportion of objects, to the extent that they



can be reproduced in drawing. They also aid in making complicated objects simple and easy to grasp as a unit. These geometrical forms are measures of form in the sense that we recognize other and more complicated forms through their aid. These measures of form are common in all form, both natural and artificial. We see them in the shape of trees, plants and shrubs; of leaf, bud, flower and fruit; in the shape of bird, animal and reptile, and in what they make. The hills and dales, forms of water, great clouds, the broad masses of light and shade, are all full of these simple form measures. The architect combines them in endless variety and ever changing proportion; the engineer in his greatest works and most complicated problems never departs from the simplicity of these form measures. The carpenter, the blacksmith, the cabinetmaker, the tailor, the dressmaker, artist and artisan, from the designer of the greatest skyscrapers to the humble workman who digs the foundation, base their work on these simple fundamental forms.

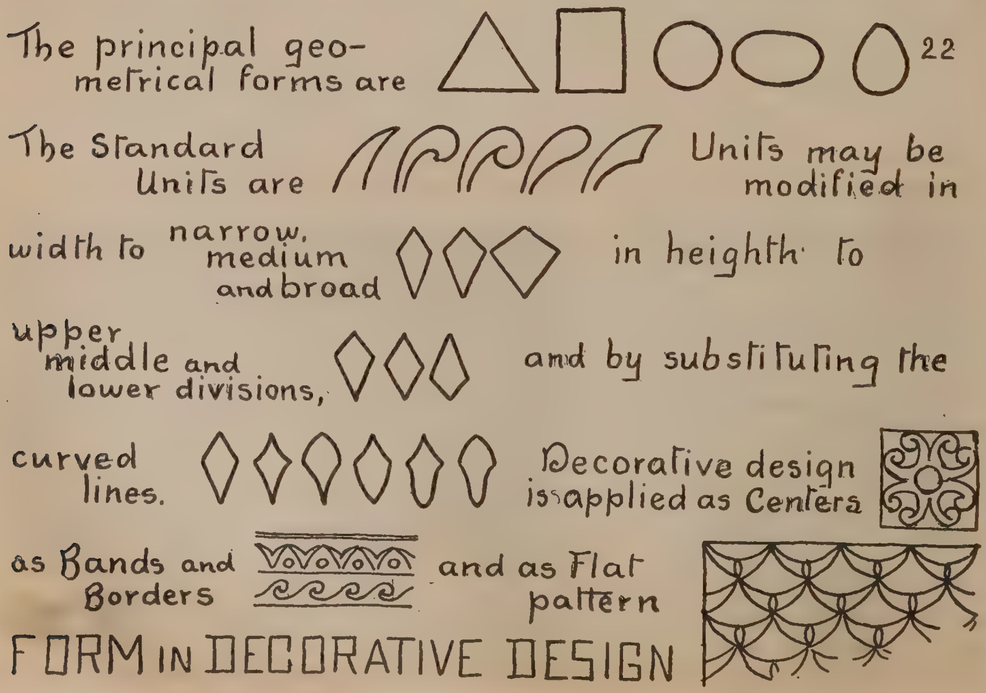


In Fig. 5 the triangle is seen in the wigwams. In Fig. 6 these forms are seen more or less in the tree tops and the houses. They are common in Fig. 9. The birds' nests in Fig. 12 are triangular, rectangular, round, oval and elliptical, and in decorative design they are the fundamental forms.

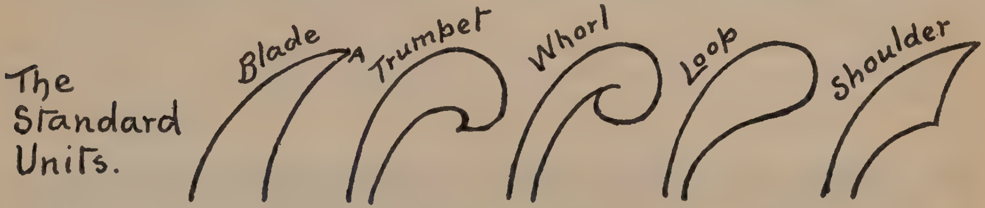
In Fig. 28 the forms are used in designing a pitcher. In like manner they could be used in designing any other object.

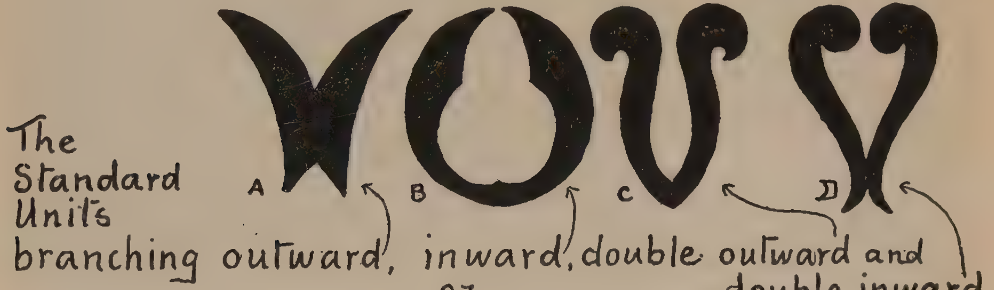
Drawing the Measures of Form. A measure of form to be used must be thoroughly learned—learned so well that it can be drawn easily and quickly. The best way to learn these forms is to draw them.

All measures of form should be drawn with


22
The principal geometrical forms are
The Standard Units are
Units may be modified in
width to narrow, medium and broad
in heighth to
upper middle and lower divisions,
and by substituting the
curved lines.
Decorative design is applied as Centers
as Bands and Borders
and as Flat pattern
FORM IN DECORATIVE DESIGN

light lines—with sketch lines. These forms are not an end in themselves but merely a means to an end, and for that reason should be drawn so lightly that it will not be necessary to erase them in the completed drawing.




The Standard Units branching outward, inward, double outward and double inward.
A
B
C
D

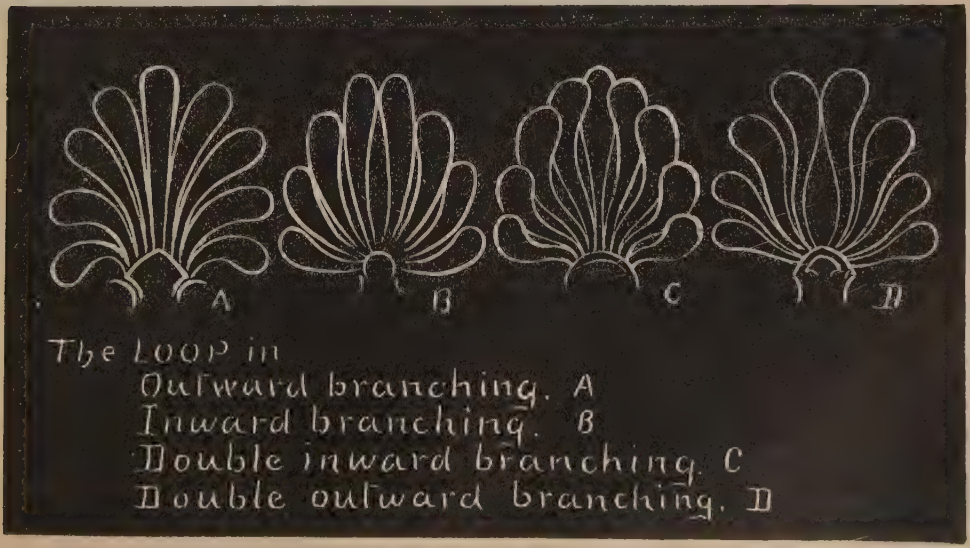
23

Draw these form measures offhand, without the aid of ruler or compass, and with the minimum of guide lines, dots and other devices. Draw the ellipses, ovals and circles without aid of any sort. It can be done. At first the results are discouraging, but as the student gains in power and acquires the swing of the lines, his efforts become more and more accurate until crowned with success.

Draw the measures of form about two or three inches long on paper, and from fourteen to twenty inches on the blackboard.

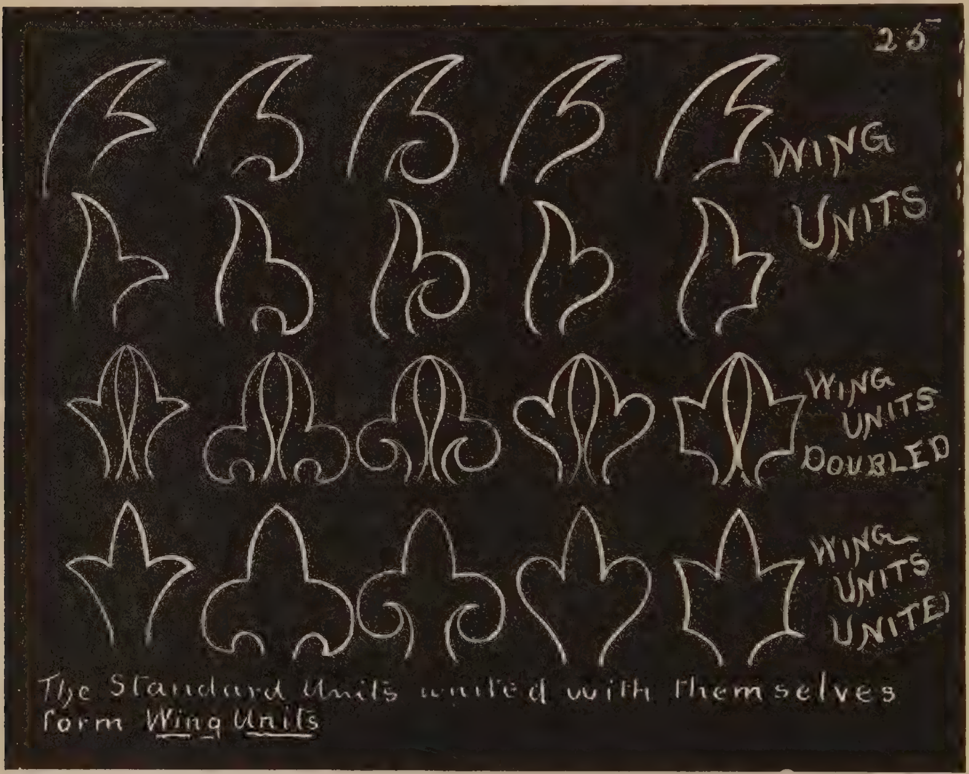
When turning these measures of form into other objects, use a full range of line. Use all or as many of the lines in Fig. 10 as is necessary. The test of knowing these forms is the ability to draw them and use them as measures of form—to use them as measures of the great world of form.

An excellent way to learn these forms is to



use them as measures of other forms. For example, procure a palm leaf fan; study it, draw it until you have learned how to represent it, then draw fans shaped like the various form measures. Do the same with a padlock, a pitcher, jug, teapot, sign board, and similar objects.

The Chief Measures of Form. The triangle, rectangle and the circle are the most important of the measures of form. By adding the third dimension to these forms, the prisms are made, giving the triangular prism, the rectangular prism, and the cylinder, which become the measures of solids.


25
WING UNITS
WING UNITS DOUBLED
WING UNITS UNITED
The Standard Units united with themselves form Wing Units

The triangular prism is the form measure for objects containing oblique lines.

The rectangular prism, or box form, is the form measure for square-cornered objects.

The cylinder and the sphere are the form measures for objects containing curved lines.

In these form measures are represented the mechanical elements of drawing, and are the form basis of a vast range of objects that more or less embrace all form. These measures of form must be learned thoroughly; we must know them as we know the multiplication table, so well that they can be used instantly, without confusion or hesitation.

Parallel Drawing

The Rectangular Prism or Box Form. In Fig. 31 are represented the rectangle and the three most important triangles and their prisms. Read from the top downward, and in the first column we have, first, a right angle; then a rectangle; then a rectangular prism; then an oblique rectangular prism, showing the order of origin and the order in which they should be studied.

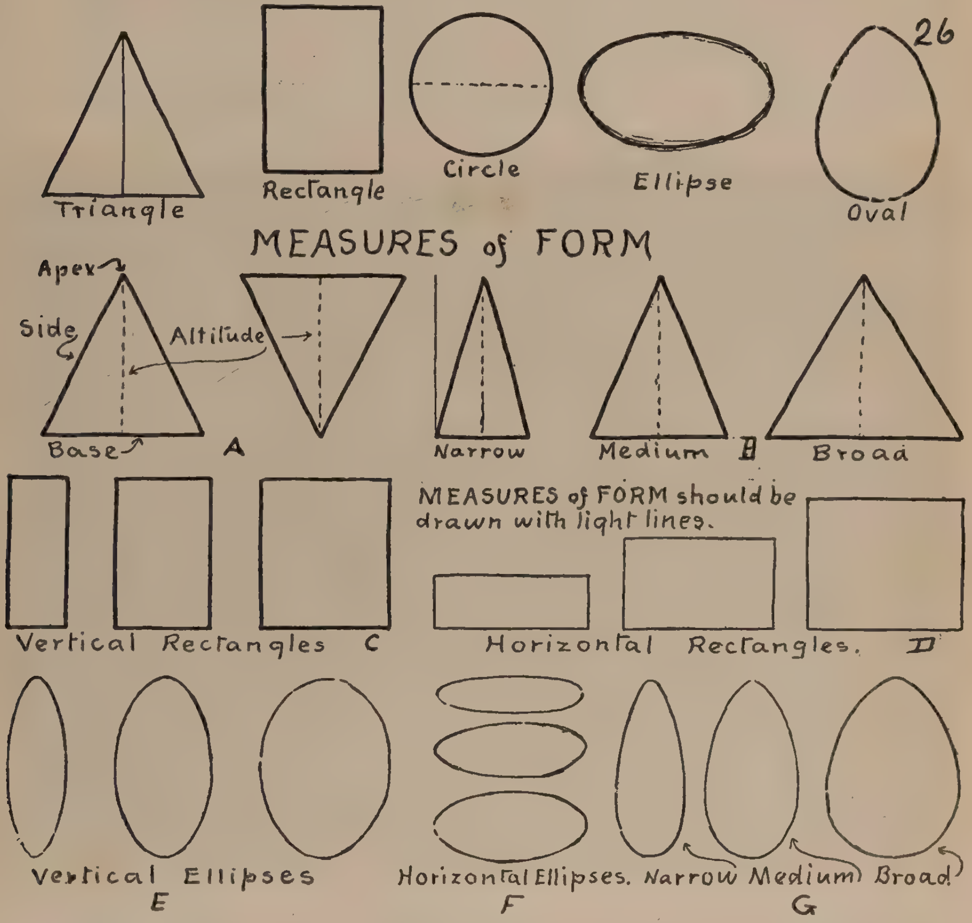
Parallel drawing, or as it is often called, parallel perspective, is represented by row C. *Parallel drawing* is representing objects with the front face parallel with the surface on which the drawing is made. This surface is called the picture plane.

Oblique drawing, or oblique perspective, is represented when the object is drawn at an angle with the surface on which the drawing is made.

Fig. 32 represents a box with the front face open and toward you. Procure such a pasteboard box and place it on the table before you in the same position and observe that the box has:

1. Six faces—Top face, bottom face, front face, back face, right face and left face.

2. Four vertical edges, four horizontal edges, and four horizontal receding edges.



26

MEASURES of FORM

MEASURES of FORM should be drawn with light lines.

3. Twelve edges or lines in all. These lines are divided into three sets of four lines each: A set of four vertical lines, a set of four horizontal lines, and a set of four horizontal receding lines. The vertical lines are all drawn parallel with the sides of the paper on which the drawing is made; the horizontal lines parallel with the top and bottom of the paper, and the horizontal receding lines all converge to a point.

The horizontal receding lines converge to a point called the eye-point, or center of vision. This is an imaginary point directly opposite the eye, to which all horizontal receding lines converge.

The horizon line represents the level of the eye, and is often called the level-of-the-eye-line. The horizon line is to show whether the top or bottom of objects can be seen. If the object is below this line, the top can be seen, and if above, the bottom can be seen. The horizon line always passes through the center of vision.

The center of vision, or eye-point, shows where the horizontal receding lines converge and also whether the right or left face of objects can be seen.

Observe in Fig. 33:

That the box can be drawn in nine positions.

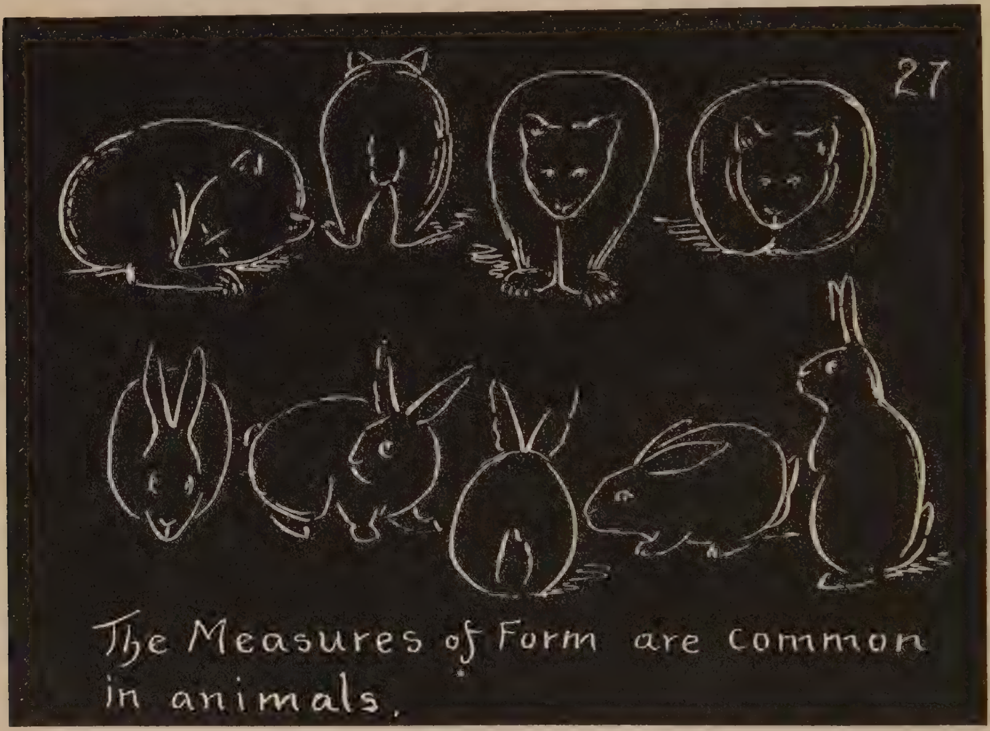
That when drawn above the level of the eye, the bottom faces can be seen. (Boxes H, C and I.)

That when drawn below the level of the eye, the top faces can be seen. (Boxes F, B and G.)

That when drawn at the left of the eye, the right faces can be seen. (Boxes H, D and F.)

That when drawn at the right of the eye, the left faces can be seen. (Boxes I, E and G.)

That the vertical lines are all drawn parallel with the sides of the paper on which the drawing is made; that the horizontal lines are all drawn parallel with the top and bottom of the paper, and that all the horizontal receding lines converge to the eye point, or center of vision.


27
The Measures of Form are common in animals.

There can be but one center of vision in each drawing.

The box forms are drawn as follows:

(1) Draw the front face, A, B, C, D, Fig. 34.

(2) Choose the center of vision.

(3) Choose the point E and draw the remaining lines.

First make the drawing with a very light sketch line, then finish with heavier lines.

Do not use a ruler or straight edge.

Make the drawings on paper, about 1½ x 2½ inches. On the blackboard the drawing should be at least 7 x 12 inches.

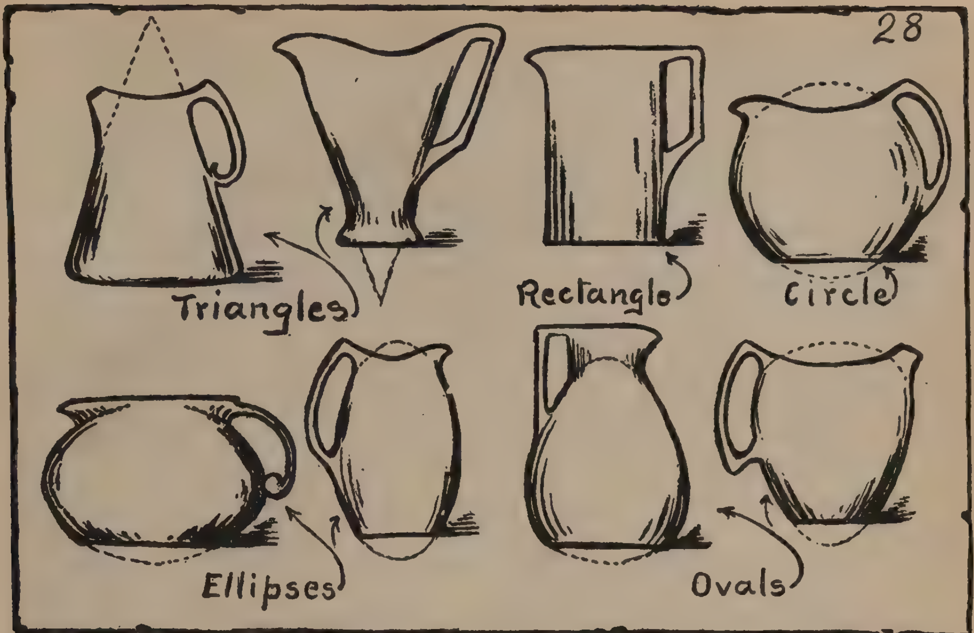
Use the model. Compare your drawing with a model, not so much to see if your drawing looks like it as to see if you have the correct principle.

Trees may be introduced into these drawings by placing the top, or foliage part of the tree, above the horizon line, and the trunk below it, as in Fig. 33.

The best way to learn these positions is to draw them. Practice exercises such as these: Draw a box below the eye; above the eye; at the right of the eye; at the left of the eye; below and at the left of the eye; above and at the left of the eye, and similar exercises. Introduce trees, balls and similar objects to make a picture effect.

Fig. 35 represents block or box 1 as drawn below the eye, block 2 added to the left face, and block 3 to the right face. In A there is a similar combination. In B there is a box drawn above the eye, and in C, one below and at the left of the eye, with balls placed on each side. In D boxes of all sizes are piled up around the center of vision, and in E there is a box drawn below and at the left of the eye and the front face removed. These are all suggestions on parallel drawing.

28



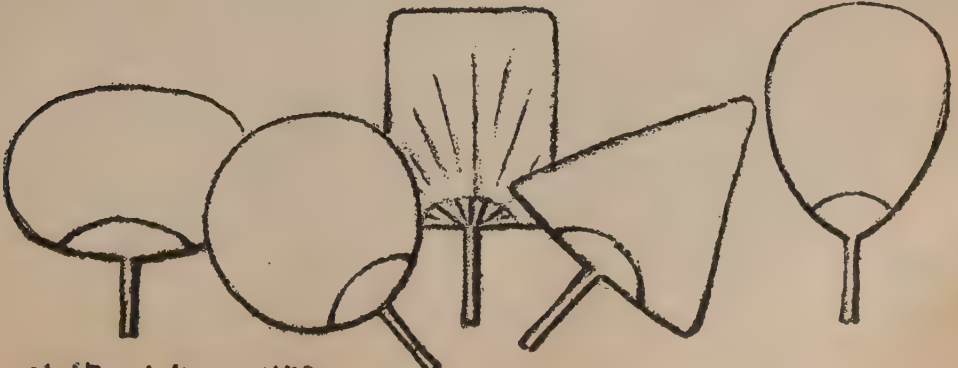
The **MEASURES** of **FORM** say to the designer that you can make your pitcher triangular, rectangular, round, elliptical or oval.

Make arrangement of blocks similar to A. An object above the eye shows the bottom face, and is supposed to be in the air, as the box in B. Place objects, as the balls in C, on various faces. The birds on the blocks in the large drawing are similar in principle to the placing of the balls in C. It is interesting to pile boxes promiscuously, as in D. Remove the various faces from boxes, as suggested in E.

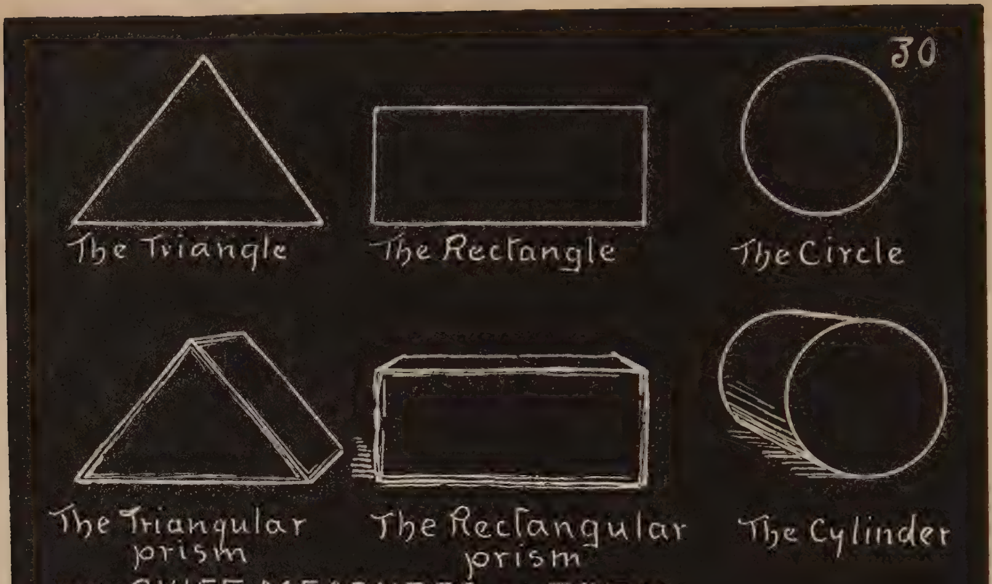
A, B and C, Fig. 36, represent the triangular prisms, which are drawn in the same manner and obey the same principle as the rectangular prism. The rectangular and triangular prisms together make up the principal house forms, as shown in D, E and F. In Fig. 36, D is called a shed roof, and E and F, gable roofs.

These houses may be drawn in all of the positions represented in Fig. 33. A, Fig.

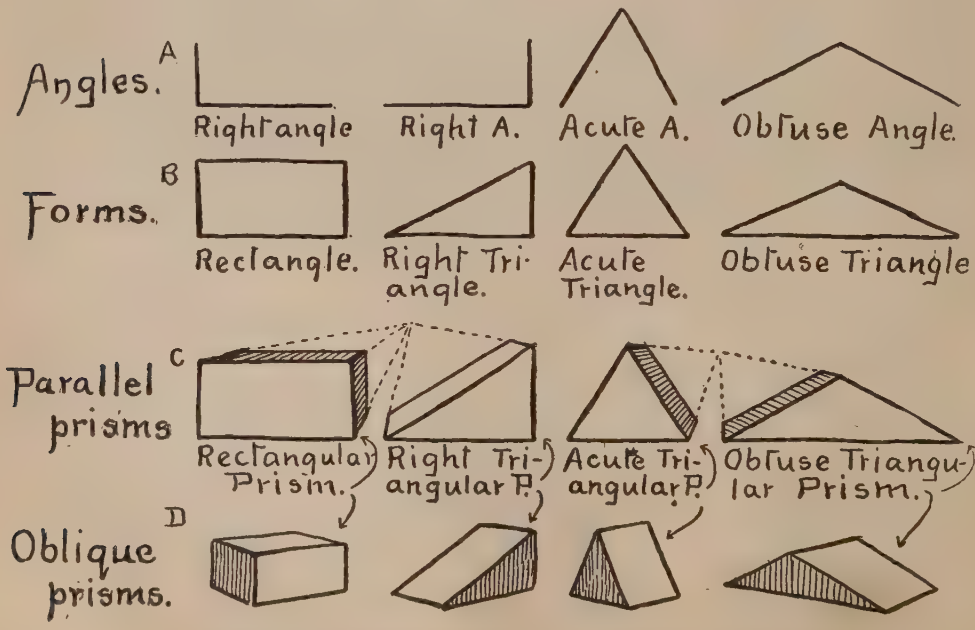
29



Units of measure used to design Fans.



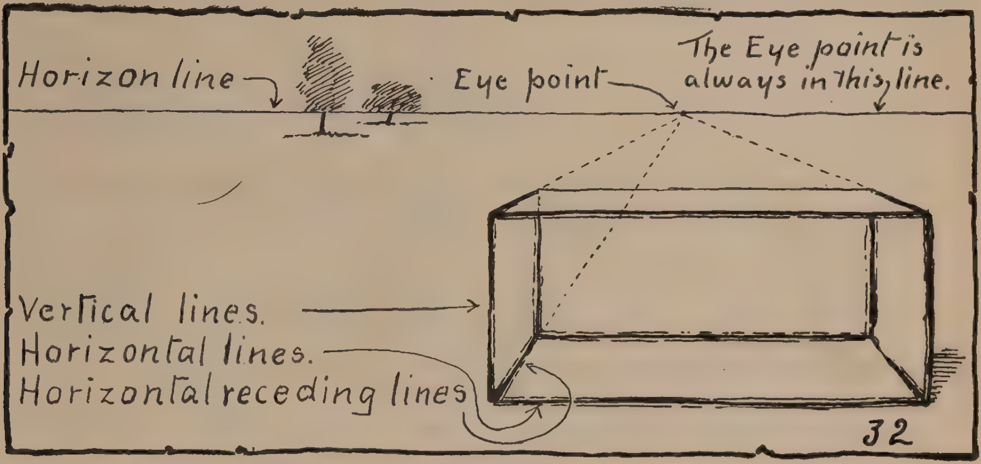
THE CHIEF MEASURES of FORM.



The MEASURES of FORM for Objects containing straight lines. 31

37, represents a house drawn at the left of the eye, and B, a shed at the right of the eye.

We have studied the angles and forms as shown in Fig. 31; then the prisms in parallel respective, as shown in the third horizontal row, and now we will study the prisms in oblique position as shown in the last horizontal row. The aim is to show how to draw straight-lined objects in an oblique position, or in oblique perspective, as it is often called.


Horizon line
Eye point
The Eye point is always in this line.
Vertical lines.
Horizontal lines.
Horizontal receding lines

32

In oblique drawing the center of vision is not the hand, neither are there vanishing points of any kind. The whole dependence is put on the unaided hand and eye.

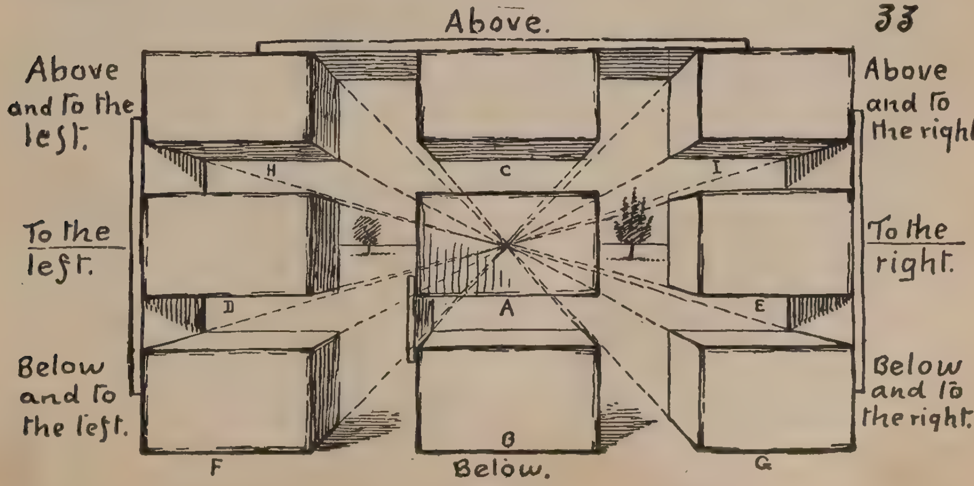
The rectangular prism, as shown in Fig. 38, is the principal figure. This must be thoroughly learned. It must be drawn over and over until it can be drawn with ease and a fair degree of accuracy, for it is the basis of a large class of objects, and if this is learned thoroughly it becomes the basis of the whole class.

Place before you a common pasteboard box in the position of Fig. 38, and observe the three sets of lines. AAAA, BBBB and CCCC. The lines of the first set are vertical and parallel. The sets of lines marked B and C are receding and consequently converge slightly, but in the drawing they should not appear to converge, but should appear parallel and natural.

Draw the rectangular prism in the order of the numbers, beginning with line 1, then line 2, and so on, as shown in D, Fig. 39.

The faces are named top, bottom, right

33



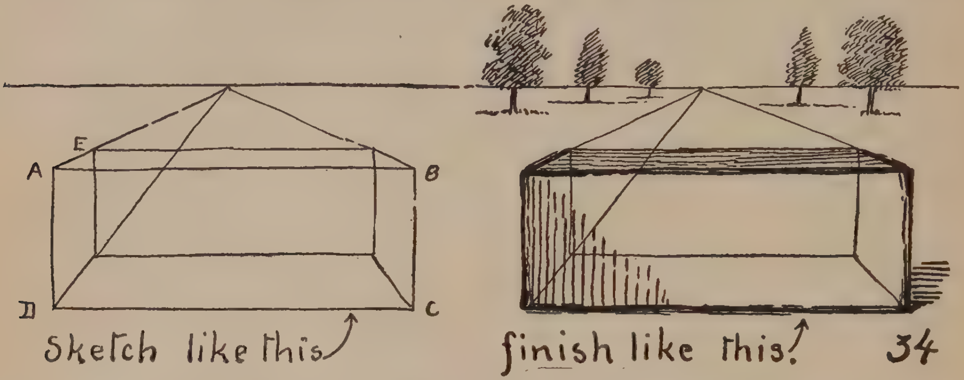
POSITION— The nine positions of the Box.

front, left front, right back and left back.

Draw all prisms and objects with light lines, and then finish with heavier.

Draw the receding lines longer than they are to appear in the object, so as to judge more accurately of their correctness.

Fig. 39 represents the principal forms of the rectangular prism that may be used in drill work.



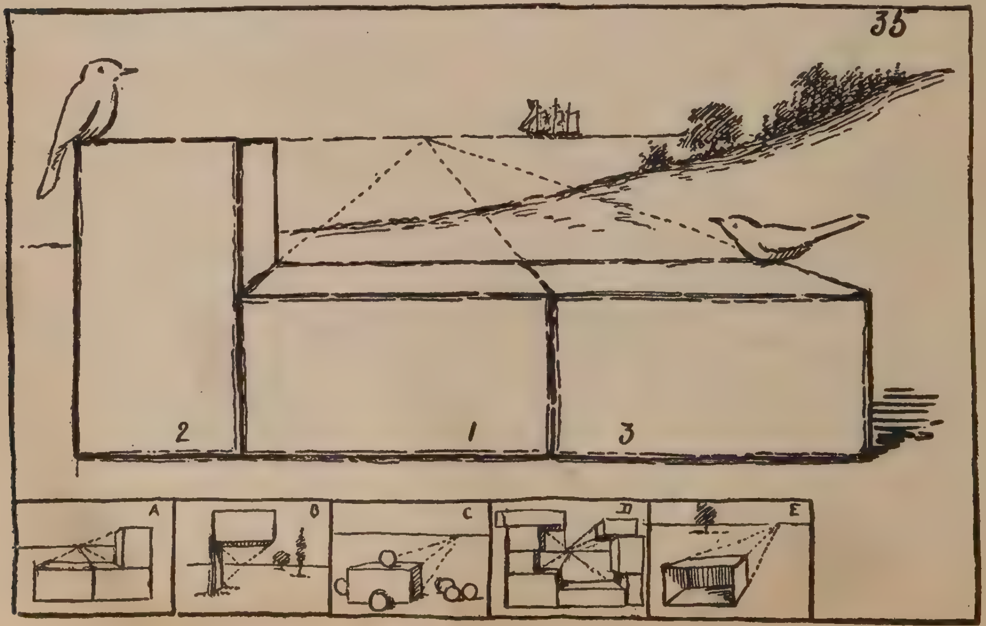
Learn to draw these forms quickly, with ease and a fair degree of accuracy.

The lunch box in Fig. 40 is an application of oblique drawing. All of the drawing in parallel perspective can be drawn in oblique perspective, and that may and should be the drill work in learning this branch.

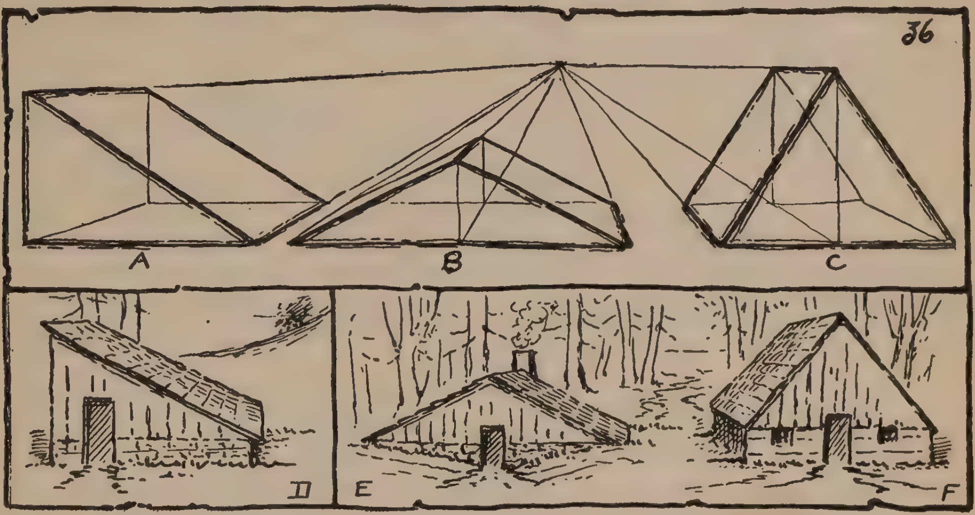
Draw, for example, in oblique perspective the triangular prisms A, B and C, Fig. 36, and then draw their applications, as shown in D, E and F. Draw the houses in Fig. 37. Do this until this kind of drawing is learned.

The Cylinder. With the addition of the cylinder, our measures of form are complete. The four rows of forms in Fig. 41 represent the mechanical basis of practically all form. These are the measures of form that underlie the arts and crafts, the engineering professions, and the great world of form. These are the basic forms for all making and building, and are common alike in the fashioning of delicate jewelry and the building of a great skyscraper.

The cylinder is the measure of form for



objects having curved lines. It is the mechanical basis of cylindrical shaped objects.

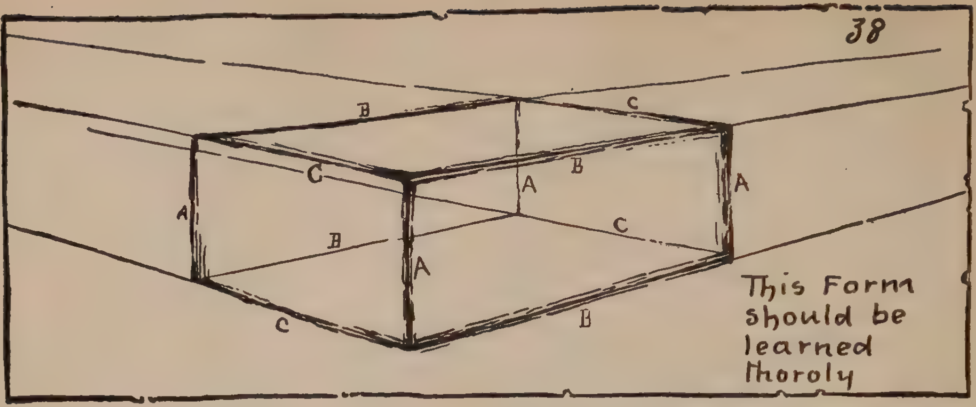


The leading directions of the cylinder are the vertical, the horizontal, the receding (horizontal receding), and the oblique (oblique horizontal receding). These four directions are the ones most commonly used in drawing cylindrical shaped objects; of these the first three are in parallel drawing and the last in oblique drawing.

These four cylinders must be thoroughly learned, learned to the extent that they can be easily, quickly and skilfully drawn. The test of knowing the cylinder is the ability to use it in drawing a great variety of similar forms.

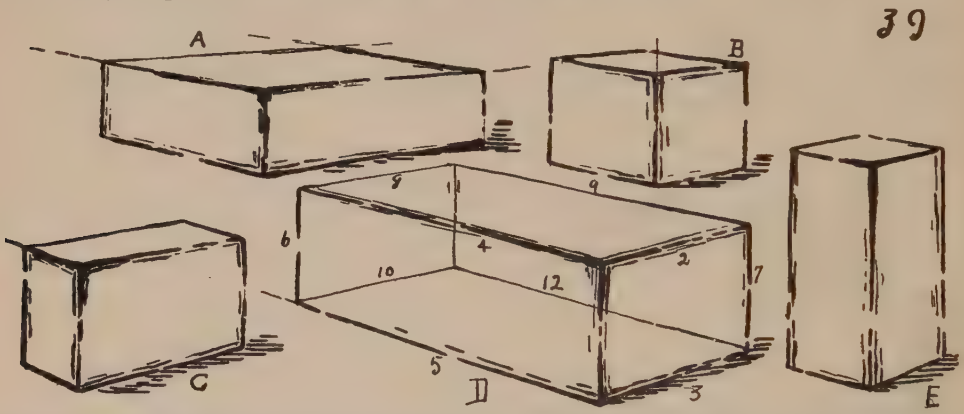
Models. Use a variety of models. A roll of pasteboard or paper two inches long, a small fruit can, a plain tumbler, and cylindrical blocks, are all good models. These models are not to draw from as in object drawing, but are to aid in understanding and learning the cylinder.

The cylinder and sphere are the last of the type forms. The cylinders, together with the rectangular and triangular prisms, are

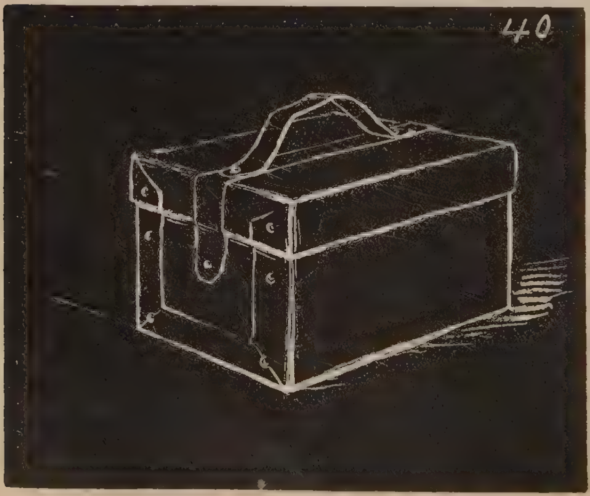


a complete set of measures for all forms. There are no more to learn.

The vertical and horizontal cylinders are drawn alike, except in direction. The unseen end in each is drawn somewhat wider than the seen end. It is necessary to draw all of the unseen end to make correctly the part that can be seen. Draw the cylinder offhand and in the order of the numbers marked on the lines.



Draw the cylinder about two inches in diameter on paper, and about twelve inches on the blackboard. Mark in the light lines and finish with heavier.



The Receding Cylinder. The receding cylinder corresponds to the horizontal receding lines, hence the sides converge to the center of vision.

The center of vision is used when drawing this cylinder.

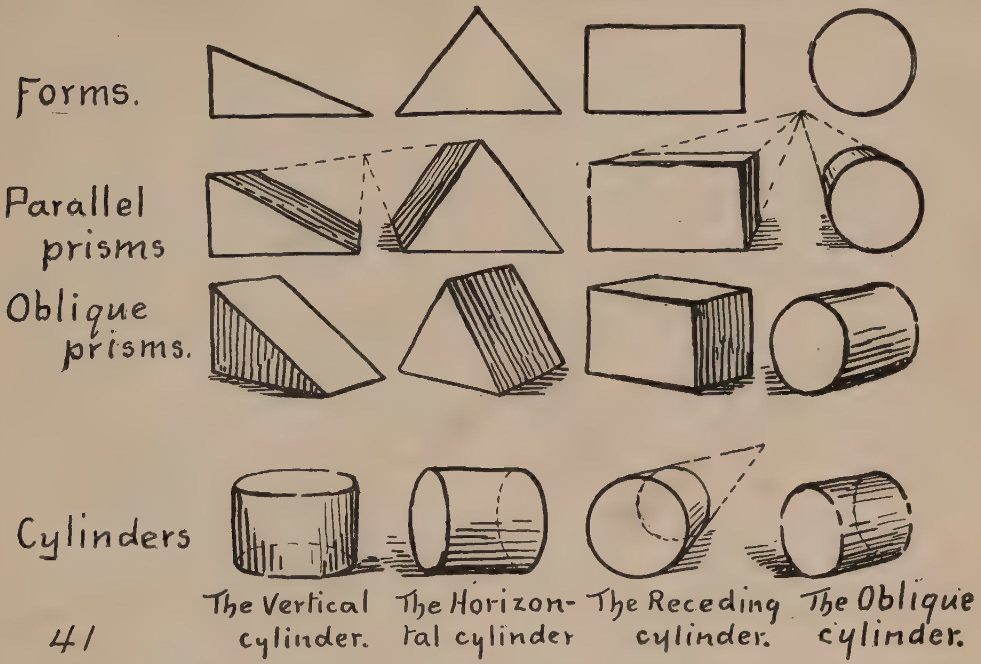
Both the seen and unseen ends are circles; both are alike, except in size.

It is at right angles with the picture plane.

The entire unseen end should be drawn.

The Oblique Cylinder. The oblique cylinder corresponds to the oblique, horizontal receding lines, hence the sides converge to a vanishing point.

The vanishing point is not used when drawing this cylinder.



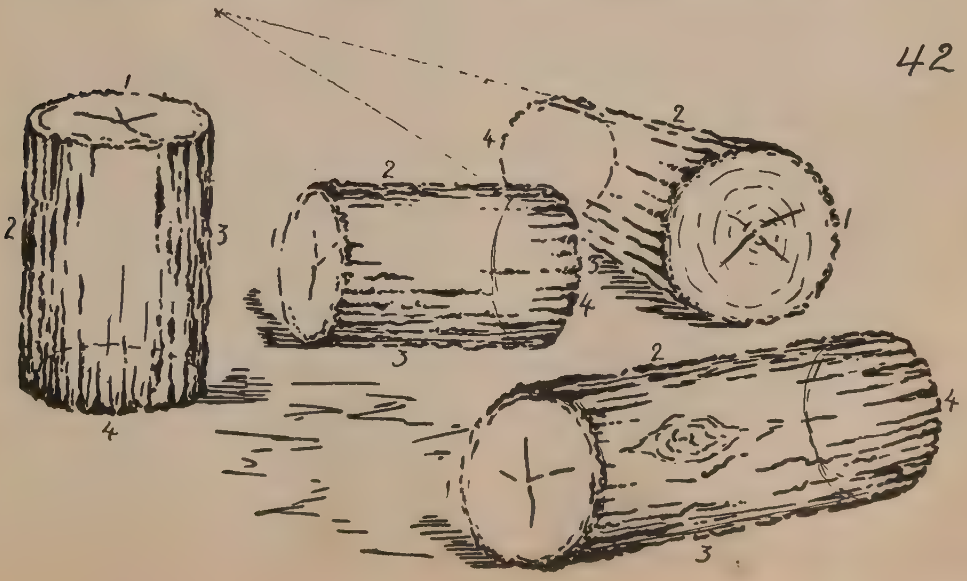
41

Both the seen and unseen ends are ellipses; both are alike, except in size.

It is at an oblique angle with the picture plane.

The entire unseen end should be drawn.

These four cylinders must be thoroughly learned. They must be learned so well that they can be drawn easily, quickly and with a fair degree of accuracy. By learning these cylinders, the mechanical elements of all objects similar to a cylinder are being learned. It is well to draw these cylinders several times each day until learned.



42

DREAMS, *dreemz,* trains of ideas which present themselves to the mind during sleep. In dreaming there is no voluntary control over the current of thought, and the principle of suggestion has unlimited sway. A sensation of cold may cause one to dream of snowstorms and freezing; a ray of light may incite a dream of fire, or the action of an undigested meal may bring a train of horrible imaginings. Dreams may in a general way indicate the condition of a person's health and are the frequent accompaniment of some forms of disease.

Usually there is no coherence in the images that appear, but the most extraordinary contradictions excite no surprise in the dreamer. Occasionally, however, intellectual efforts are made during sleep that would be difficult to surpass in a waking state. It is said that Coleridge composed *Kubla Khan,* a beautiful fragment of a poem, while asleep, and other men have done equally incomprehensible things in sleep.

DREDGING, *drej'ing,* the process of removing mud, sand and other obstructions from the bottom of a body of water. Dredging is usually employed for the purpose of deepening harbors and removing obstructions to navigation. The form of dredge in most common use in the United States is that known as the *dipper* dredge. In its construction and working it very closely resembles a steam shovel, except that it is mounted on a barge, instead of on a car (see STEAM SHOVEL). The dipper holds from five to fifteen cubic yards and is emptied into a barge, which is held in position alongside the dredge. It may be operated in water to the depth of fifty feet. Several patterns of dipper dredges are used. A popular one is known as the *grapple* dredge; it opens and closes around the earth or stones to be lifted and is of advantage where a direct vertical motion is necessary. Another form of dredge useful in soft bottoms is the *suction* dredge; by its use the mud or ooze is mixed with water and pumped through pipes to the surface.

DRED SCOTT DECISION, a decision of the United States Supreme Court, delivered by Chief Justice Taney, March 6, 1857, in which important questions concerning slavery were decided. The plaintiff, Dred Scott, was a slave in Missouri; his owner took him to Illinois, a free state, then to Minnesota, a free territory by the Missouri compromise, and finally back to Missouri, a slave state. The plea of Scott was that his residence in Illinois and Minnesota made him a free man. The Supreme Court of Missouri decided against him, and the United States Supreme Court upheld this decision. It decided that Scott was not a citizen; and in additional statements declared that a negro was not considered in American law to be a man, but a chattel, "without rights or privileges except such as those who held the power and the government might choose to grant him." The decision practically admitted slavery to every territory in the Union. It aroused indignation in the North and was one of the important incidents that led within four years to the Civil War. See UNITED STATES, subhead *History.*

DRESDEN, *drez'den,* GERMANY, the capital of the former kingdom of Saxony, is situated on the River Elbe, 111 miles south of Berlin. Among the chief edifices, besides several of the churches, are the Museum, in the northeast wing of the building called the Zwinger, a beautiful structure containing a famous picture gallery and other treasures; the Japanese Palace, or Augusteum, containing the royal library of about 400,000 volumes, besides a rich collection of manuscripts; and the Johanneum, containing the collection of porcelain and the historical museum, the latter possessing a valuable collection of arms, armor and domestic utensils, belonging to the Middle Ages. The court theater is one of the finest structures of the kind in the world.

The city is distinguished for its excellent educational, literary and artistic institutions, among which are the Polytechnic School, much on the plan and scale of a university; the conservatory and school of music and the Academy of Fine Arts. The chief glory of the city, however, is the gallery of pictures, among which is the world's most famous painting, Raphael's *Sistine Madonna.* Dresden, being thus rich in treasures of art and being favored by a beautiful natural situation, is the summer resort of many foreigners, and is sometimes called the "German Florence." It suffered severely in the Thirty Years' War and also in 1813, when it was the headquarters of Napoleon's army. In 1918 the king of Saxony, Frederick Augustus II, abdicated, as did the other hereditary German rulers (see WORLD WAR). Population, 1921, 587,758.

DRESDEN CHINA, a fragile kind of chinaware, made at the royal factory at Meissen, near Dresden, in Saxony. It was first made in 1709, when Johann Friedrich Böttger, chemist to the elector of Saxony, produced the formula. The manufacture has continued to the present day and includes a variety of shapes. A certain style of delicate ornamentation identified with this china is called *Dresden.*

DRESS, or COSTUME. Man is the only member of the animal kingdom not provided with a natural garment to protect him from the weather. Furs, hair, scales, feathers and shells are the equipment of beast, bird and fish, and they need take no thought of what they shall wear. Why and when did primitive man, dwelling in the tropics, first array himself in clothes? This question has come to everyone who has studied dress and its relation to the progress of civilization. Some say that an innate sense of refinement was the cause of this action on the part of the savage; others say that the desire for adornment inspired him, and that the sense of modesty developed as a result of his being covered. However that may be, as the human race progressed and different tribes migrated into regions far removed from the equator, garments became a necessity, and dress came to have an established place among the customs of different peoples. As civilization advanced, so did dress, and to-day, generally speaking, the people of the most highly developed nations are the best dressed.

Modern fashions became standardized after the period of the French Revolution. While details vary from year to year, the garments of men and women in Europe and America follow certain general modes based on skirts for the women and trousers for the men. There are, however, certain distinctive forms of national dress that seem to hold their place regardless of the rest of the world. For instance, the Highland Scot still wears his belted plaid, the Russian peasant his smock, and the Tyrolean mountaineer his short breeches, green blouse, conical hat and picturesque cloak. In North America the Eskimo wears a hood, short trousers and boots of fur and feathers, a costume similar to that of the earliest Eskimos of whom we have any record. The American Indian in many places wears only a loin cloth and blanket, such as the early redmen wore, but, barring these and a few other exceptions, no one style of dress has been common in Europe and North America during the past two centuries. The same general articles of dress have been worn, but the color, shape and trimmings of these garments have varied according to the dictates of fashion, which is governed by the influential classes, and is quite uniform each season throughout Europe and America.

Ancient Dress. Our knowledge of the dress of the earliest peoples is obtained from rude sketches and sculptures and from myths and traditions. Sculptures found in Mesopotamia and Egypt, dating from 300 B. C., show a garment made from a large oblong piece of cloth, carried over the left shoulder and under the right arm, the two edges overlapping on the left side of the body and the left leg. This garment seems to have been commonly used among men and women of high position. Other persons wore only a piece of cloth hanging from a waist belt over the thighs. The Assyrians, who were skilled in dyeing, weaving and embroidering, came to be celebrated for the richness of their attire. It was characteristic of the ancient Greeks that they wore very simple and graceful costumes. In earliest times the dress of the men consisted of a *himation* or *chlamys* only, a garment worn open on one side; later a *chiton,* a close-fitting, sleeveless shirt, reaching below the knees, was worn under the himation. The women wore a loose chiton of fine linen, reaching to the feet and confined below the bust by a girdle. Sometimes a woolen shawl, called a *peplos,* was draped over the chiton. The costume of the ancient Romans was similar to that of the Greeks. They had one characteristic garment, the *toga,* a large, loose cloak, under which was a chiton, called a *tunic.* The only other garment was a sandal worn to protect the foot.

The Middle Ages. When the Romans invaded Northern Europe the attire of the barbarian chiefs consisted of striped pantaloons and a shirt having sleeves. The women wore simple, loose gowns, usually of wool, with sleeves and girdle. In the Middle Ages the nobles and knights were so constantly engaged in fighting that the most important feature of their attire was necessarily the armor. Both men and women wore cloaks so long that all other details of the costume were concealed. There was never much of a tendency among any ancient people, except the Chinese, to try to fit the clothing to the figure, but near the end of the Middle Ages garments came into fashion which required careful cutting and fitting and much sewing. The dress for women was close-fitting about the bust, waist and hips and gored so as to be very loose and full in the skirts. That for men consisted of a tight-fitting coat, called a *doublet*, laced or buttoned close to the body, and long, snug-fitting stockings.

Related Articles. Consult the following titles for additional information:

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Fur and Fur Trade
Glove
Gold Lace
Hat
Hemp
Lace
Leather
Linen
Mohair
Tunic
Turban
Wool and Woolen Manufacture

DREW, John (1853–), an American actor who has won distinction in comedies of society life. In his particular field he is excelled by no one and he has few equals. Drew is the son of the Irish comedian John Drew and of the talented Louisa Drew, a well-known stage personage in her day. He is also the uncle of the Barrymores, Lionel, John and Ethel (see Barrymore).

At his mother's theater in Philadelphia he made his first professional appearance, and three years later went to New York, where in the years which followed he took various parts under Edwin Booth, Fanny Davenport and other stars. From 1875 to 1892 he was connected with Augustin Daly's company, of which he was for years the leading comedian, winning great popularity as Petruchio in the *Taming of the Shrew* and as Charles Surface in *A School for Scandal.* The plays in which Drew won success as a star include *A Marriage of Convenience, The Liars, Richard Carvel, The Tyranny of Tears, The Will, Rosemary, The Prodigal Husband, Major Pendennis* and *The Gay Lord Quex* (with Margaret Illington). In 1918 failing eyesight compelled him to retire from the stage for a period of rest.

DREX'EL, Anthony Joseph (1826–1893), an American banker and philanthropist, born in Philadelphia. He became head of the firm of Drexel & Co., Philadelphia, after having been identified with it since the age of thirteen. He was a liberal patron of science and art, especially music, and founded Drexel Institute of Art, Science and Industry (see below). He was associated with George W. Childs in the inception of the Childs-Drexel Home for Union Printers at Colorado Springs, Colo.

Drexel Institute of Art, Science and Industry, a co-educational institution founded in Philadelphia in 1891 by Anthony J. Drexel. The purpose of the institute is to provide instruction and training in the arts and sciences directly related to industries. The school maintains courses in electrical engineering, fine and applied arts, commerce and finance, mechanical drawing and machine construction, domestic science, mathematics, physics, chemistry and English. Both day and evening classes are provided in all departments, also free public lectures. Admission is obtained through examination or upon presentation of a diploma from an approved high school. The building and equipments exceed $4,000,000 in value, and there is an endowment fund of $2,000,000. The library contains about 30,000 volumes. More than 1,200 students attend the day classes and about 2,000 are in the evening classes.

DREYFUS, *dra'fus*, Alfred (1859–), a French artillery officer, who suffered appallingly because of a conspiracy against him on account of his Jewish ancestry. He was born in Alsace, but moved to Paris in 1874 and took up a course of study to prepare himself for his profession. In his studies and in his service in different regiments he proved himself most able, and in 1891 he was appointed to the general staff. Three years later, without warning, he was arrested on a charge of having sold military secrets to a foreign government. The court which tried him was a secret one; Dreyfus was condemned on the most inadequate evidence and was sentenced to solitary imprisonment on Devil's Island, French Guiana (see French Guiana).

Gradually the conviction became general that Dreyfus was innocent and had been the victim of a conspiracy. The effects of the case were far-reaching. The reputations of high officials were ruined, and great corruption was disclosed in the French army. Throughout the trial, and afterward, the most active defenders of Dreyfus were his brother, Matthieu Dreyfus, and Emile Zola, the novelist (see ZOLA, EMILE). At a second trial, in 1899, Dreyfus was again convicted, but he was pardoned by President Loubet. Retiring to his country estates, he began a fight for vindication. This ended in complete success in July, 1906, when the Supreme Court of France acquitted him of the charge of any wrongdoing and rebuked his accusers. He was then made a major in the army and was enrolled in the Legion of Honor.

DRIFT, a deposit left by an ancient glacier, or detritus collected by rivers. Glacial drift was either carried or pushed along by the glaciers and left wherever they grounded and melted. It consists of compact masses of sand and gravel and boulders worn smooth by the movement of the ice, and is found in many mountain regions. See GLACIAL PERIOD; GLACIERS.

DROMEDARY, *drum′e da ry,* a small camel. The name is applied both to a variety of the Arabian camel and also to a variety of the Bactrian. The animal easily travels five hundred miles in six days. It can live on a very small amount of food and requires only short periods for rest. See CAMEL.

DROP′SY, a diseased condition in which there is swelling in various parts of the body, due to an excess of watery fluid in the tissues. The source of this fluid is the blood. If a person suspects that he is dropsical, he may determine the truth by pressing a finger on the swollen part. When dropsy is present a small pit will remain after the finger is removed. If medicines fail to remedy a dropsical condition, tapping is sometimes necessary, the liquid being drawn off through a drainage tube. Dropsy is a common symptom of heart, liver and kidney trouble.

DROWN′ING, death by suffocation, the air being excluded from the lungs by a liquid. It is only necessary that the mouth and nostrils be immersed to cause death in this manner. It is probable that complete insensibility comes within one or two minutes after such immersion, but death does not ensue until from two to five minutes after, and cases have been known where persons recovered after having been under water a much longer time. As in other forms of asphyxiation, efforts to restore life to a patient should not be abandoned for a long time, even though no apparent signs of life exist. Instances are known where people have been revived after hours of apparent death. In all attempts to resuscitate the drowned, prompt action is necessary, but excitement, confusion and haste are not only unnecessary but are really wasteful of time and energy. The rescuer should proceed after some such plan as the following:

Place the body on its face with a roll of clothing under the stomach, the head being supported on the hand. Pull the body over the roll of clothing, to expel the water from the chest; if necessary, press upon the back from the waist toward the shoulders. If the tongue closes the mouth, take it between the fingers, pull it forward and hold it downward. Cleanse the mouth and nostrils from sand or dirt, if they have entered. When the lungs are thoroughly emptied, turn the body on the back and support the shoulders. It the person seems to have stopped breathing, begin at once to stimulate artificial respiration, as described below. In the meantime, if other people are present they should rub the upper part of the body and the limbs vigorously and continuously to encourage circulation, and if the body is very cold, they should lay bottles of hot water about it; but remember that too much heat is dangerous.

Artificial breathing may be induced in the following manner: While the body is lying on its back, with the shoulders slightly raised, kneel over it; place both hands on the lower part of the chest, so that the thumbs hook in under the lowest ribs and the fingers are spread out on the chest; steadily press forward, raising the ribs, your own body being thus thrown forward. This enlarges the cavity of the chest and causes air to enter. When the ribs have been raised to the utmost extent, push yourself back, with a slight effort, to a more erect position, allowing the ribs to return to their natural position. This expels the air. Repeat the process fifteen times a minute. Be careful that the tongue does not fall backward and close the windpipe; if necessary, fasten it forward with a band around the jaw. It is never necessary to be rough with the patient. Gentle, firm and regular movements are the best. As soon as the person is sufficiently restored to be able to swallow, give small quantities of hot brandy and water, hot wine and water or hot coffee, and use every effort to restore and maintain warmth.

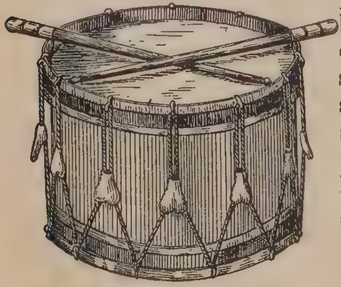
DRUGGIST, *drug′ist.* See APOTHECARY.

DRU′IDS, the priests of the Celts of Gaul and Britain, who, according to Julius Caesar, possessed the supreme authority there. They had some knowledge of geometry and natural philosophy, superintended the affairs of religion and morality and acted as judges. They held the oak tree sacred, also mistletoe that grew on it. They had a common superior, chosen from among their number and elected by vote. He held office for life. The Druids surrounded themselves with mysteries, and it is probable that they cherished doctrines which were unknown to the common people; but that they had a great secret philosophy which was handed down by oral tradition is very unlikely. Their public ceremonies were held around rude stone altars and within circular enclosures marked by large stones set at intervals on end. Such circles may be seen at Stonehenge in England. It is thought by scientists that these stones were placed not by Druids but by a people who lived long before their time. The Druids were nearly exterminated by the Romans. See STONEHENGE.

DRUM, the first musical instrument made by man, and the only one yet known among a few tribes in interior Africa. There they take fantastic forms; some are known as *tom toms,* and are beaten with the open hand, but all are made on the same principle as the modern drum.

KETTLEDRUM

A drum is either cylindrical or hemispherical in shape, with the end or ends covered with tightened parchment, which is stretched or slackened at pleasure by means of cords with sliding knots or screws. Drums are of three kinds: 1. the *long* or *bass drum,* played with drumsticks having stuffed knobs on the end, and used only in large orchestras or military bands; 2, the *snare drum,* having two heads, the upper one only being played upon by two sticks of wood; strings or snares, are stretched across the lower one, giving a peculiar resonant tone; 3, *kettledrum,* a hemisphere of brass or copper, the end of which is covered with parchment. Kettledrums are always used in pairs, one being tuned to the keynote, and the other to a higher key, the compass of the two together being an octave.



SNARE DRUM

DRUM'MOND, HENRY (1851–1897), a famous preacher, professor and author, born at Stirling, Scotland, educated at Edinburgh University and the University of Tübingen, Germany. In 1877 he became professor of natural science in the Free Church College of Glasgow. During one of his vacations he visited America on a geological expedition to the Rocky Mountains. The lectures given in the course of this tour furnished the foundation for his *Natural Law in the Spiritual World.* He also explored Australia and Africa in search of certain rare species of animal life. In 1893 he traveled through the United States, lecturing before college students and in the larger cities. Up to the time of his death he was engaged in religious work in the colleges of England and Scotland and, with Dwight L. Moody, in the United States. He was a magnetic preacher and a vigorous, stimulating writer. The works upon which his fame rests are *Natural Law in the Spiritual World, The Greatest Thing in the World, Pax Vobiscum, Tropical Africa* and *The Ascent of Man,* a reply to extreme Darwinian views.

HENRY DRUMMOND

DRUMMOND, WILLIAM HENRY (1854–1907), a Canadian physician and author, born at Currawn House, Ireland, and educated at Mohill and at the Montreal high school and Bishop's College, Lennoxville, Quebec. He engaged in the practice of medicine in Montreal and at the same time held the chair of medical jurisprudence in the faculty of Bishop's College. He was widely known as a writer as well as a physician, his contributions of dialect poetry having given him considerable fame. Among these *The Habitant, Phil-o-rum's Canoe, Johnnie Courteau* and *The Voyageur* are the best known of his works. (For portrait, see article CANADA.)

DRUM'MOSSIE MOOR. See CULLODEN MOOR.

DRUNKENNESS. See ALCOHOLISM.

DRUSES, *drooz'ez,* a curious people, of mixed origin probably of Kurdish, Persian and Arab stock, inhabiting the mountains of Lebanon and Anti-Lebanon. Their faith is a strange mixture of Mohammedanism and superstitions of various kinds. They are a self-contained people, and the secrets of their religion are not well understood. They number about 90,000.

DRYADS, the wood nymphs of classic mythology. According to ancient belief there was in each tree a dryad, whose life was inseparably connected with its growth. When the tree perished the dryad died. The name was also applied to nymphs who merely lived in forests.

DRY BATTERY. See ELECTRIC BATTERY.

DRY'DEN, JOHN (1631–1700), an English poet, dramatist and satirist, the greatest writer of the Restoration period in England. He was descended from a good family, and was born near Aldwindle, Northamptonshire. After leaving Cambridge University he went to London as secretary to his cousin, Sir Gilbert Pickering, a favorite of Cromwell. On the death of the Protector he wrote his *Heroic Stanzas* on that event, his first poem of importance, and two years after producing this eulogy of Cromwell, with characteristic tact he wrote a poem in celebration of the restoration of Charles II.

JOHN DRYDEN

His first drama, *The Wild Gallant,* produced in 1663, was unsuccessful. Following it, in rapid succession, nearly thirty plays proved Dryden the foremost dramatist of his time. Unfortunately, he did not use his exceptional ability to elevate the stage, but pandered to the corrupt tastes of the time. Many of his dramas are now classed as immoral. In 1670 Dryden was appointed to the offices of royal historiographer and poet laureate.

The first of his political satires, *Absalom and Achitophel,* produced in 1681, had as its object the censure of the Earl of Shaftesbury and his followers for trying to secure for the Duke of Monmouth the succession to the throne. This was followed by *The Medal,* a satire against sedition, and *Mac Flecknoe,* a satire on the poet Shadwell. As a member of the Church of England, Dryden wrote, in defense of that church, his *Religio Laici;* but when, after the succession to the throne of the Catholic James, Dryden became a Catholic, he declared his new beliefs in the *Hind and Panther.* When William and Mary came to the English throne, Dryden was deprived of the offices of poet laureate and historiographer. During the remaining ten years of his life he produced some of his best work, including his admirable translations from the classics and his *Ode in Honor of Saint Cecilia's Day,* better known as *Alexander's Feast,* one of the finest odes in the English language.

DRY DOCK. See DOCK, subhead *Dry Docks.*

DRY FARMING, a term which does not mean the science of farming on dry soil; it relates to the production of crops on land favored with only a slight rainfall. If less than ten inches of rain falls yearly upon any section of country that area is classed as an arid region, where agricultural effort is fruitless. Formerly it was believed that when rainfall did not exceed twenty inches in a year the prospects for agricultural returns were slight. It is still true that where there is less than fifteen inches of rain all effort is discouraging, but there has developed a principle embodying the conservation of moisture and its storage in the ground which makes good crops possible on millions of acres of land where there is from fifteen to twenty inches of rain. The processes of this conservation and storage constitute dry farming.

Dry farming is essentially a method of preparing the soil so that it will hold moisture as long as possible. The process of cultivation consists chiefly in deep, fall plowing, followed by harrowing. The disk harrow should be used before sowing and later as long as the growing crops permit. The deep plowing and frequent harrowing form a mulch of fine soil upon the surface which prevents evaporation. An important feature of the preparation of the soil is the use of the roller or sub-surface packer. Campbell, in his *Soil Culture Manual,* says that the "packer must follow close to the plow. The plowing done before noon should be packed before going to dinner, and that done in the afternoon packed before leaving the field at night."

The best crop for dry farming seems to be wheat. Corn is also profitable, and potatoes, sugar beets, alfalfa, and even peaches and other fruits have been successfully cultivated. There are, at the present time, about 800,000 acres in the United States and Canada available for dry farming. Nearly all of this area is in the western states, from Arizona north to Montana, and in southern Alberta and Saskatchewan.

DRY ROT, the decay of timber, due to a fungus which develops in the wood and destroys the fibers. A log so attacked is finally reduced to powder on the inside, though the outside covering of wood remains sound. In spite of the name of the disease, the fungus causing it can develop only in moist situations. The spores often find their way into logs through cracks in the ends; a sure safeguard is to season the timber thoroughly and then cover it with paint.

DRY TORTUGAS, *tor too′gaz,* a group of ten small islands belonging to Monroe County, Florida, situated in the Gulf of Mexico, about 120 miles southwest of the southern extremity of Florida Peninsula. The islands are low and partially covered with mangrove bushes. One contains a lighthouse; another, an old Spanish fort, which is the southernmost building on United States territory.

DU BARRY, *du ba re′,* MARIE JEANNE BECU, Countess (1743–1793), a mistress of Louis XV. This monarch became infatuated with her about 1769 and married her to the Comte Du Barry so that she might be brought to court. Until the death of Louis she was the real ruler of the country; the most vital points in the policy of the government were decided by her. She was banished from the court after the death of Louis XV, and in the time of the Revolution was tried for having dissipated the public wealth and executed.

DUBLIN, IRELAND, the capital of the country, is situated in Dublin County, 135 miles west of Liverpool, on the east coast of the island, at the mouth of the Liffey, the banks of which for more than three miles from the sea are lined with docks. At right angles to the river is Sackville Street, a splendid avenue forty yards wide, forming a thoroughfare which is continued across the river by O'Connell Bridge, a magnificent structure the same width as the street. The principal public secular buildings are the Castle, dating from the fifteenth century, the official residence of the Lieutenant-Governor; the Bank of Ireland, formerly the Irish Parliament house; Trinity College; the courts of justice; the customhouse; the King's Inns; the post office; the rotunda; the corn exchange; the mansion house, and the city hall, or corporation buildings. The most important educational institutions are Dublin University, the Royal University, the Royal College of Science, the Roman Catholic University and the Royal Dublin Society. The environs of Dublin are remarkably beautiful. A little northwest of the city, up the Liffey, is Phoenix Park, with an area of 1,759 acres, and Glasnevin, once the favorite residence of Swift, Steele and Sheridan, all of whom were born in Dublin.

In the Sinn Fein and anti-conscription riots and the general unrest incited by German agencies during the World War severe fighting and rioting occurred in the streets of the city; several of the finest public buildings, including the post office, were greatly damaged, and many people were killed or injured. Numerous leaders of the rebellion were executed.

Dublin was taken by the Danes in the ninth century and was in their possession until the English conquest. Population, 1911, 309,272; including suburbs, in 1916, 406,000.

DUBLIN, UNIVERSITY OF, an institution founded in 1591 by Queen Elizabeth, as the College of the Holy and Undivided Trinity. It is usually spoken of as Trinity College, and is the most important institution of learning in Ireland. The corporation now consists of a provost, seven senior fellows, twenty-six junior fellows and seventy foundation scholars. The senate possesses the right of electing the chancellor of the university; it is also the body which grants degrees. The scholarships are tenable for five years, or till the degree of M. A. is attained. Admission is by examination, and the course of general instruction extends over four years. The number of students is usually about 1,300.

DUBOIS, PA., a borough in Clearfield County, eighty miles northeast of Pittsburgh, on the Pennsylvania, the Lake Shore & Michigan Southern, the Buffalo & Susquehanna and the Buffalo, Rochester & Pittsburgh railroads. Coal mining is the principal occupation, but there are also iron works, tanneries, railroad repair shops and blast furnaces, besides manufactures of mining and agricultural implements. Dubois was settled in 1873, and was made a borough in 1881. Population, 1910, 12,623; in 1920, 13,681, a gain of 8 per cent.

DUBUQUE, *doo buke',* Iowa, the county seat of Dubuque County, about 170 miles west of Chicago, on the Mississippi River and on the Chicago Great Western, the Chicago, Burlington & Quincy, the Illinois Central and the Chicago, Milwaukee & Saint Paul railroads. The railroad bridge across the river is owned by the Illinois Central; two vehicle bridges are owned by local companies. The river commerce is considerable.

The city is an important agricultural market, and has lead and zinc mining interests. There are also railroad repair shops, pork-packing houses and lumber mills, manufactories of boots and shoes, wagons, hardware, furniture and overalls, as well as scores of lesser enterprises. There has been considerable ship building, also. Two sash and door factories and pump factories are said to be the largest of their kind in the world; the sheet metal works rank also among the largest. The city has a public library and a United States government building and is the seat of Saint Joseph's College, Mount Saint Joseph's Academy, Wartburg Seminary, Dubuque College and the Iowa Institute of Science and Arts. It is the oldest city in the state and was named in honor of Julian Dubuque, a French Canadian, who located here in 1778. The first permanent settlement was made in 1833. Population, 1910, 38,494; in 1920, 39,141.

DUC'AT, a coin formerly common in several European states, especially in Italy, Austria and Russia. Some ducats were made of silver, some of gold. The average value of the former was from 75 cents to $1.10, that of the latter, about $2.32. The most famous ducats, those of ancient Venice, had a value equivalent to $1.46. The ducat is featured in *The Merchant of Venice.*

DUCHY, *duch'i,* a dominion or territory ruled by a duke or duchess. If the ruler is a grand duke or grand duchess, the country is styled a *grand duchy.* The present most conspicuous example in the world is the grand duchy of Luxemburg (which see), the ruler of which is the Grand Duchess Charlotte (born 1896). She assumed office on January 15, 1919, after the abdication of her sister, Marie Adelaide. See World War: also, Duke and Duchess.

DUCK, a web-footed bird, related to the goose and the swan. It is everywhere considered a table delicacy, especially a number of the wild varieties, and therefore within reasonable limits it is the legitimate prey of sportsmen. Game laws protect it except during a short season in the autumn. The species can be classed as *deep sea* ducks, which often obtain their food by diving to a great depth, and *river* ducks, which remain in shallow water. Some species are migratory, going northward in summer to their breeding places. The duck's food is partly vegetable, partly animal.

Description. Ducks have short, thick bodies, covered with thick feathers, under which is a fine, soft down. In some varieties the feathers are beautifully colored. The bill is broad and flat, with toothed edges, for holding or straining food. The head is rather large; the neck, long and gracefully curved, yet much shorter than the neck of the goose or swan. The feathers are well oiled from glands situated ahead of the tail, and are therefore waterproof. A peculiar characteristic of the short legs is that they are located back of the center of the body; this causes a strange movement in walking, sometimes called a "waddle."

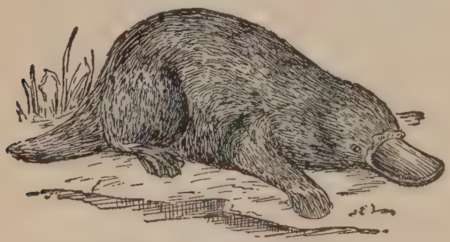
The food of the wild ducks consists largely of insects, minnows, small frogs, grain, grasses, etc.

Varieties. The common *mallard,* or wild duck, is the original of the domestic duck. In its wild state the male is characterized by the deep green plumage of the head and neck, by a white collar separating the green from the dark chestnut of the lower part of the neck and by having the four middle feathers of the tail recurved. Some tame ducks have nearly the same plumage as the wild ones; others vary greatly, being generally duller or pure white, but all the males have the four recurved tail feathers. There are several favorite varieties of the domestic duck, those of Normandy and Picardy in France and the Aylesbury ducks in England, being remarkable for their great si and delicacy of flesh. The *musk duck,* erroneously called the *Muscovy duck,* a native of South America, is the largest of the duck kind and approaches nearly the size of a goose. The *canvasback duck* is peculiar to America and is celebrated for the excellence of its flesh.

BILL OF MALLARD DUCK
As seen from above and from the side

Other species of ducks are the *shoveler,* remarkable for the strange form of its bill; the *gadwall,* which is more rare in America than in Europe; the *pintail,* remarkable for its long tail; the *black,* or *dusky, duck,* peculiar to America, and very abundant; the *summer,* or *wood, duck* remarkable for its great beauty and for its migrations, which are directly opposed to those of other species; the *teal,* prized for its flesh, and the *eider duck,* so well known for its down. See EIDER DUCK; GADWELL; SHOVELER; also the colored plate in article GAME.

DUCK-BILLED PLAT′YPUS, or **DUCK′-BILL,** also called *ornithorynchus,* the lowest of the mammals, a peculiar creature, living in the quiet streams of Australia, Tasmania and New Guinea. It is about twenty inches long, rather slender and covered with brown hair. Its head is small and instead of a nose it has a horny bill, resembling a duck's with nostrils, however, at the extreme end, enabling the animal to breathe with only the tip of his bill out of the water. The male has on each heel a sharp, horny spur, which he uses for defense. Duckbills usually live in large colonies in the banks of streams, each pair inhabiting its separate burrow. The food consists chiefly of insects and worms, which the animal comes out to get at night. On land, duckbills walk about very clumsily on their short legs and webbed feet, but in water they move very rapidly.



DUCK-BILLED PLATYPUS

DUCKBILL ASLEEP

DUCK′ING STOOL, a device used in former times in Great Britain and in the American colonies to punish a scold. It consisted of a chair fastened at the end of a strong beam, which, by means of a pivot, could be dipped into a pool or river. The culprit was placed in this chair, fastened securely and then dipped into the water. In some parts of England the ducking stool was in use up to the early years of the nineteenth century, and was only recently abolished by law in Delaware.

DUCTIL′ITY, the property of solid bodies, particularly metals, which renders them susceptible of being drawn into wire. Gold is of all metals the most ductile. Following, in the order of their degree of ductility, are silver, platinum, iron, copper, zinc, tin, lead and nickel. Gold can be drawn into wire so fine that 500 feet of it will weigh less than a grain, and platinum, when combined with silver, can be drawn into wire 1–30,000 of an inch in diameter. Glass can be drawn into a thread so fine that a mile of it will weigh only one-third of a grain.

DUDEVANT, *du d'vahN′,* MADAME. See SAND, GEORGE.

DUEL (from the Latin *duellum,* from *duo,* two), a prearranged combat between two persons, with deadly weapons, for the purpose of deciding a serious private difference or quarrel. The combat generally takes place in the presence of witnesses, called *seconds,* who make arrangements as to the mode of fighting, place the weapons in the hands of the combatants and see that the rules they have prescribed are carefully followed. Dueling probably originated with the combats of "champions" which in times past settled various disputes, notably those arising over titles to property. It was to some extent the outcome of the spirit and institutions of chivalry. Though generally prohibited by law, duels are common in the army and among university students in Germany, and to a less extent in France; they are very rare in the United States. In some of the states the killing of a man in a duel is punishable by death or by forfeiture of political rights, and in a large number the sending of a challenge is a felony.

DUERO, *dwa′ro.* See Douro.

DUF′FERIN AND AVA, Frederick Temple Hamilton Blackwood, Marquis of (1826–1902), a British diplomatist and statesman, Governor-General of Canada from 1872 to 1878. He was educated at Eton and Oxford. After spending several years in managing his Irish estates he soon became a prominent member of the Liberal party, was sent on a number of important foreign missions and also held several Cabinet positions under Lord Palmerston, Earl Russell and Gladstone. In 1872 he was appointed Governor-General of Canada. Here he was given opportunity to display his brilliant abilities in dealing with the many problems of the newly-formed Dominion. His great personal charm, added to his known ability, combined to make his administration one of the most popular in the history of Canada. He returned to England in 1868 and for nearly thirty years continued in public service, successively as Ambassador to Russia, British commissioner in Egypt, viceroy of India, Ambassador to Italy and Ambassador to France. (Accompanying the article Canada is a halftone group containing a picture of Dufferin.)

DUGONG′, a native mammal of the Indian seas, resembling the whale in some respects. It has a tapering body, ending in a crescent-shaped, finlike tail, and is said sometimes to attain a length of twenty feet, though generally it is about seven or eight feet long. The thick, smooth skin is bluish on the upper and white on the lower parts of the body, and bears a few scattered bristles. The dugong's food consists of marine plants, which it finds in the mouths of large rivers. It is hunted by the Malays for its flesh, which resembles young beef.

DUGONG

DUISBURG, *düs′boorK,* Germany, a flourishing town in Rhenish Prussia, thirteen miles north of Düsseldorf. It is an ancient place, believed to be of Roman origin. It early rose to be a free town and became a member of the Hanseatic League (which see). Düisburg possesses a beautiful church of the fifteenth century, and has iron manufactories, engineering works, chemical works and cotton and woolen mills. It also is the seat of a large export trade in coal. Population, 1910, 229,478; 1918, 619,800, the increase due to enlargement of munitions factories during the World War; 1919, 244,302.

DUKE AND DUCHESS, *dutch′es.* In Great Britain and several other European countries the title *duke* is the highest hereditary rank after that of prince. The title *duchess* is borne by the wife of a duke, or by a lady who possesses sovereign rights in a duchy. The title *duke* was first adopted in England under Edward III, who in 1337 conferred the title Duke of Cornwall upon his son, the Black Prince. In Great Britain a duke is addressed as "Your Grace," or in writing, "The Most Noble, the Duke of——." The eldest son of a duke has the rank of marquis and is called *lord,* while younger sons and all of the daughters are by courtesy addressed as *lord* and *lady.* French dukes under the republic have no special privileges, the title indicating merely noble descent. In the former German Empire some of the Princes of the smaller states were of the rank of duke.

DUKHOBORS, *doo ku bawrz′,* a religious sect which originated in Russia in 1733. Their name means *spirit wrestlers,* and refers to their denial of the divinity of the Holy Ghost. Persecutions by the Russian government caused numbers of them to emigrate to Canada in 1902, where there are now about 9,000 of the sect. They are an industrious, harmless people, and though they do not believe in organized government, they have never caused trouble. They believe that all persons are equal and all are children of God. They have no church ceremonies, and marriage is contracted without formalities, though it is held sacred.

DUL′CIMER, a musical instrument of ancient origin. Its constituent parts are a frame with a bridge on which wires are stretched horizontally over a sounding board. Tones are produced by striking the wires with small mallets. The dulcimer was probably taken to Europe from Asia in the time of the Crusades, and from it evolved the modern piano.

DULUTH, *du looth'*, MINN., third in size among the cities of the state and county seat of Saint Louis County, about 155 miles northwest of Saint Paul and Minneapolis, at the west end of Lake Superior. It has the service of nine railroads—the Chicago & North Western, the Northern Pacific, the Great Northern, the Chicago, Milwaukee & Saint Paul, the Duluth, Missabe & Northern, the Duluth, South Shore & Atlantic, the Duluth & Iron Range, the Minneapolis, Saint Paul and Sault Sainte Marie and the Duluth, Winnipeg & Pacific.

Duluth's commerce in iron ore from the rich fields nearby is enormous. More than 7,000,000 tons of ore are carried by boat every year from this city and from Superior (Wis.), across the bay formed by the Saint Louis River, to South Chicago, Gary (Ind.), Conneaut (Ohio), and Ashtabula (Ohio), to reach the great steel mills of the country. The natural harbor is nine miles long and two miles wide; entrance to it is by two canals. Another cause of Duluth's importance lies in the fact that it is the nearest city for water and rail transportation from the great grain-growing areas of the Northwestern United States. Duluth and Port Arthur, Ontario, share in the receipt of grain from the Canadian Northwest. The total yearly tonnage which is cleared from Duluth and Superior exceeds 56,000,000.

Among the hundreds of industries the leading ones are a blast furnace, a steel plant, machine shops, iron works, a cement factory, saw mills, lumber mills and flour mills. The city is the location of one of Minnesota's state normal schools; it has a Carnegie Library, a United States Fisheries Building, a custom house and a hydrographic office. Spanning one of the canals is a famous aerial bridge, whose floor is raised high in the air to permit vessels to pass underneath.

The city is built on hills which ascend abruptly, with the result that streets are so steep that on some of them automobiles cannot be driven from the business quarter to the residence section. From almost all parts of the city there is afforded a fine view of the great harbor. There are in the city about 400 acres of parks and twenty miles of boulevards.

The commission form of government was adopted in 1912. The first settlement of a permanent character was made in 1853; it took its name from Sieur du Luth, who explored the vicinity in 1679. Until 1855 the land on which the city stands belonged to the Indians. In 1857 a town charter was granted, and in 1870 the town became a city. It then had about 3,000 people. Population, 1910, 78,466; in 1920, 98,917, a gain of 26 per cent.

DUMA, or **DOUMA**, *doo'mah*, the lower branch of the Russian Parliament, established by an edict of Czar Nicholas II in 1905. This body was reorganized in 1907, and continued to be the only popular national assembly of the Russians until the revolution of March, 1917. At the beginning of the revolution it was supplanted as an instrument of government by a provisional committee made up of certain of its members, and in June it was abolished by a vote of the All-Russian Congress of Workmen's and Soldiers' Delegates.

The Duma never possessed extensive powers. It could not discuss the reports of the Minister of Finance or charges of malfeasance against officers of the government or members of the Council; it could not consider questions relating to titles of nobility or entailed estates. The Ministers had more legislative power than the regular legislative body, for while any member of the Duma could propose a law, this could not be presented to the house until it had received the approval of the Minister of the Department concerned.

DUMAS, *du mah'*, ALEXANDER (1802–1870), a French novelist and dramatist. He was the grandson of the Marquis de la Pailleteries and a negress named Dumas, from whom he inherited many characteristics, both physical and mental. In 1823 he took up his residence in Paris and obtained, through the Duke of Orleans, afterward Louis Philippe, an assistant secretaryship. He scored his first success in 1829 with the drama *Henry III*. The same year appeared his *Christine*, and other dramas followed in rapid succession. He then turned his attention to romance, with

ALEXANDER DUMAS

the definite purpose of writing a series of novels which should deal with the whole course of French history, and the result was his remarkable list of historical romances, of which the best-known are *Three Musketeers, Twenty Years After* and the *Vicomte de Bragelonne. The Count of Monte Cristo, The Black Tulip* and several others are also well known to English readers, through translations.

The works which bear Duma's name amount to almost three hundred volumes, but the only claim which he could lay to many of the productions issued under his name was that he had either sketched the plots or revised them before they went to press. He earned large sums of money, but lost it all through recklessness and extravagance. After wandering about Europe for many years, he went to live in the home of his son, whom he had neglected in his childhood and had led into much recklessness and dissipation in his young manhood, and died there.

DUMAS, Alexander (1824–1895), a French dramatist, son of the novelist of the same name. His literary career began with the publication, in 1848, of a novel, *La dame aux camelias* (*Camille*), which was presented four years later in the dramatized form. This, his best work, has retained its popularity to the present day. All of his dramas deal satirically with the follies and vices of French society and present forceful arguments for social purity.

DU MAURIER, *du mo rya′*, George Louis Palmella Busson (1834–1896), a British artist, caricaturist and novelist, born in Paris. He went to England in 1851 and made that country his home, becoming a naturalized Briton. He studied chemistry, but afterwards adopted art as a profession. After studying in Belgium and France he began to draw for *Once a Week, The Cornhill Magazine* and *Punch.* He contributed to Harper's Magazine many illustrations, besides three novels, among them *Trilby,* on which his fame chiefly rests, *Peter Ibbetson* and *The Martian.*

DUMB-BELLS, weights usually in the form of two iron balls connected by a straight piece or handle. They are used in gymnastic exercises for strengthening the muscles of the arms and chest. The dumb-bells in ordinary use weigh from one to ten pounds each, though much heavier ones are used in trials of strength. Ordinarily a person should not use those weighing over five pounds; the weight preferred for women is somewhat less.

DU′NABURG, Russia, (in Russian, Dvinsk), a city in the government of Vitebsk, 112 miles southeast of Riga. It was a center of Russian artillery interests before the World War and in 1914 had a population of about 115,000. The German army took the city and nearly destroyed it in 1916.

DUN′BAR, Paul Laurence (1872–1906), a negro poet, born in Dayton, Ohio, where he graduated at the High School and for some time served as an elevator boy. He worked at journalism in New York, and after 1898, the year of his marriage, he was on the staff of the Congressional Library. He gave frequent readings from his own works, which include *Poems of Cabin and Field; The Fanatics,* a novel; *Candle-Lightin' Time,* a volume of poems; and *Lyrics of Love and Laughter.* Dunbar usually wrote in dialect, and portrayed, with perhaps the first high poetic genius shown by his race, the actual humor and pathos of Southern negro life.

DUNCAN, Norman (1871–1916), a Canadian author and educator, born at Brantford, Ontario; educated at the University of Toronto. From 1897 to 1900 he was on the staff of the New York *Evening Post;* from 1901 to 1904 he was professor of rhetoric at Washington and Jefferson College; and he was also professor of English literature at the University of Kansas for a time. He is best known, however, as an author. His best books include *Doctor Luke of the Labrador, The Way of the Sea, The Cruise of the Shining Light, Dr. Grenfell's Parish, Every Man for Himself, Billy Topsail & Company, The Best of a Bad Job, The Suitable Child, Finding His Soul, The Bird-Store Man* and *Australian Byways.*

DUNDAS′, Ont., in Wentworth County, on the Grand Trunk and Toronto, Hamilton & Buffalo railroads. It is five miles from Hamilton, on Lake Ontario, with which it is connected by the Desjardines Canal. The town possesses unlimited water power and natural gas and has manufactories of iron castings and machinery of all kinds, also paper, leather, woolen and cotton goods, flour and wooden-ware. It is situated in a valley famous for its beauty. Population, 1916, 5,020.

DUNDEE′, Scotland, a city in the County of Forfar, on the Firth of Tay, about eight miles from the open sea and thirty-seven miles northeast of Edinburgh. It is noted for its granite quarries and for its textile manufactures, particularly those of coarse linens. Dundee is now the chief seat of the linen trade of Scotland and of the jute trade of Great Britain. Shipbuilding is extensively carried on, and there are large engineering establishments. Another branch of business is the northern seal and whale fishery. The place is also one of the aeroplane stations of Great Britain. Dundee was made a royal burgh in the twelfth century by William the Lion, and it held an important place in the medieval history of Scotland. Population, 1911, 165,006; 1921, 168,217.

DUNE, a hill formed by drifting sand. Strong winds drive sand and soil through the air very much as they drive snow. When the sand meets an obstacle like a boulder or log, some of it is lodged. Thus a small mound is formed, which continues to stop more sand. In this way low hills are formed along sandy coasts, and sometimes on the plains, where the surface soil is loose and easily disturbed. The height of these hills varies from forty to 200 feet. Dunes are quite common along the Atlantic coast, among the cliffs in England and around the southern end of Lake Michigan, a region which, on account of these peculiar formations, is of especial interest to geographers. There has been an effort to make of this Indiana dune territory a state park. See Geology; Wind.

DUNEDIN, *du ne′din*, New Zealand, capital of the provincial district of Otago, and the most important commercial town in the islands. It is situated on South Island, at the head of Otago Harbor, fifteen miles from sea. Though founded in 1848, it has made rapid progress only since 1861, when extensive gold fields were discovered. At present, gold dredging is a profitable industry. There are many handsome buildings, both public and private, among them being municipal buildings, a post office, government offices, a university, a new museum and an athenaeum. Several woolen and other manufactories are now in existence, and raw wool is exported in large quantities. There is a regular line of steamers between this port and Melbourne, and good communication with all parts of New Zealand. Population, 1921, 72,255.

DUN′KERS, DUN′KARDS, or **TUN′KERS**, a religious sect founded in Germany in 1708. It takes its name from the German *tunken*, to dip, from the mode of baptizing converts. Between 1719 and 1729, because of persecution, nearly all members of this sect emigrated to the United States and settled in Pennsylvania. They are now found in Ohio, Indiana, Illinois, Iowa and some of the southwestern states. In 1905 the total number of members was 114,194, of churches 1,125. The Dunkers wear a plain and uniform dress, have nothing to do with politics, take no oaths, avoid lawsuits and war, denounce divorce, abstain from the use of alcoholic drinks and discourage the use of tobacco. Since 1906 their official name has been Brethren.

DUN′KIRK, France, a fortified seaport town in the department of Nord, situated at the entrance of the Strait of Dover. Dunkirk lies twenty-eight miles northeast of Calais, not far from the Belgian frontier, and it was therefore a key to the possession of Calais during the World War. Furthermore, as it was used as a receiving point for supplies from England and as a military base, it was subjected to numerous bombardments from the sea and air by German forces. At the outbreak of the war it had a population of about 40,000; by 1918 the civilian population numbered about 5,000, and most of the people were living in cellars or dugouts. The industrial life of the city remained active, however, as the demands of the soldier population created business for the shops. The harbor, too, was full of shipping, Dunkirk being the port at which a great portion of food for the British was unloaded. In normal times the town has a quaint, Flemish aspect.

DUNKIRK, N. Y., a city in Chautauqua County, forty-eight miles southwest of Buffalo, on Lake Erie, and on the New York Central, the Erie, the Lake Shore & Michigan Southern and the New York, Chicago & Saint Louis railroads. There is a good harbor and a large lake trade; the industries include a Brooks' locomotive works, a steel company, foundries, planing mills and glove and shirt factories. The city contains several parks. Features of interest are Masonic and Odd Fellows' temples, a Carnegie Library and Brooks Memorial Hospital. Population, 1910, 17,221; in 1920, 19,336, a gain of 12 per cent.

DUN'MORE, Pa., a borough adjoining Scranton, in Lackawanna County, served by the Erie Railroad, built to the city in 1865. Coal mining is the major occupation of the people, one-third of whom are Poles and Italians. The town has Saint Mary's Academy, Saint Joseph's Infant Home and homes for the friendless and aged. Population, 1910, 17,615; in 1920, 20,250, a gain of 15 per cent.

DUNNE, Finley Peter (1867–), an American journalist and humorist, born in Chicago. After obtaining a common school education, he went into newspaper work. He has become famous through his creation of one *Mr. Dooley,* a publican of Archey Road, who converses on political and social topics with his friend *Mr. Hennesey. Mr. Dooley in Peace and War,* his first volume of selections, obtained a wide circulation both in America and England. Several succeeding volumes have attained deserved popularity.

DUNS SCO'TUS, John (1265–1308), one of the best thinkers of the Middle Ages, a member of the Order of Franciscans. He studied at Oxford and in 1301 became professor of philosophy there. He was an apostle of free will and an ardent defender of the doctrine of the Immaculate Conception, a doctrine which has since been declared (1854) a necessary part of the Roman Catholic faith. The chief works of Duns Scotus consist of commentaries on Aristotle, on the Bible and on the *Sentences* of Peter Lombard.

DUQUESNE, *doo kane',* Pa., a borough in Allegheny Co., near McKeesport, on the Monongahela River and on the Pennsylvania railroad. It has a Carnegie Library, an institute and extensive blast furnaces and steel works. The industrial life is centered in the steel business. The place was settled in 1885 and was made a borough in 1891. Population, 1910, 15,727; in 1920, 19,011, a gain of 21 per cent.

DURANGO, *doo rahn'go,* Mexico, capital of the state of Durango, is situated about 500 miles northwest of the City of Mexico, on a plateau 6,845 feet above the sea. It is well built, has a cathedral, a mint and manufactories of cotton and woolen goods, tobacco and flour. It is an important mining center and is in a rich agricultural region. Population, 1910, 32,263.

DURANT, Henry (1822–1881). See Wellesley College.

DUR'BAN, South Africa, the only seaport of Natal, and one of the most important ports in South Africa. Among the public buildings are the town hall, a library and a theater. The harbor is very well protected and affords excellent accommodation. The port is situated at the terminus of two railway lines leading into Orange River and Transvaal colonies. Durban was founded in 1823 by the Dutch. Population, 1921, 54,230 white, 86,094 colored.

DUR'BAR, a term used in India, to designate an important public meeting or conference. It comes from the Persian word for *audience.* At these meetings matters pertaining to state affairs in India are considered, or they may be held in honor of distinguished visitors or to celebrate some great event. A durbar of recent occurrence and of unparalleled magnificence was held in 1911, when King George and Queen Mary visited India, and the former was crowned emperor of India at Delhi. At this time Delhi was made the capital of British India, in place of Calcutta.

DURER, Albrecht (1471–1528), a German painter, designer, sculptor and engraver on wood and metal. He was the inventor of a method of printing woodcuts in two colors. In 1505 he visited Venice and henceforth his work showed the influence of the Venetian painters. Maximilian I appointed him court painter, and Charles V confirmed him in this office. He was very popular at court and also with the common people. Luther, Melanchthon, Erasmus, Bellini and Raphael were among his friends. His masterpieces in painting include *Crucifixion, Adam and Eve,* an *Adoration of the Magi* and portraits of Raphael, Erasmus and Melanchthon. Among his best engravings on copper are his *Fortune, Melancholy, Adam and Eve in Paradise, Saint Hubert, Saint Jerome* and the so-called *Smaller Passion.*

DURESS, *du res',* in law, is compulsion or restraint under which a person is forced to do a thing or to refrain from doing it. The force employed may be physical violence or detention without an avenue of escape. A person is not legally responsible for acts committed in such circumstances, but duress must be proved to establish guiltlessness.

DURHAM, Lord John George Lambton, First Earl of, (1792–1840), an English statesman, born in London and educated at Eton. He held a commission in the army on completion of his education, but soon gave his attention to politics. In 1813 he entered Parliament for Durham as an advanced Liberal. In 1828 he was created Baron Durham. In 1833 he was appointed ambassador extraordinary to Russia, and in 1838 Governor-General of Canada. While Lord Durham remained in Canada as Governor-General only six months, the conditions at the time of his appointment and his able statesmanship made a lasting impression upon the history of British North America. When appointed Governor-General, a rebellion against the home government had broken out and Canadian affairs were in a turbulent condition. Lord Durham made inquiries in the various provinces as to the exact condition of the people with regard to the form of government, and held a conference with the governors of the provinces. This conference resulted in a plan for the confederation of the provinces. He pointed out the necessity of making the executive of the government responsible to the people. As a result of his suggestions Upper and Lower Canada were united in February, 1841.

EARL OF DURHAM

DURHAM, *dur′am,* N. C., the county seat of Durham County, twenty-six miles northwest of Raleigh, on the Norfolk & Western, the Southern, the Seaboard Air Line, the Durham & Southern and other railroads. The city has extensive manufactures of cigars and cigarettes, and contains one of the largest smoking-tobacco factories in the world. There are also cotton and hosiery mills and other minor industries. It is the seat of Trinity College and has also a school of fine arts, a conservatory of music, a public library and a hospital. Durham was settled in 1855. Population, 1910, 18,241; in 1920, 21,719, a gain of 19 per cent.

DUSE, *doo′za,* ELEANORA (1859–), possibly the greatest Italian actress of the latter part of the last century. Her first appearance, at thirteen years of age, made no distinct impression, and it was not until several years later that her remarkable talents were recognized. Gradually, however, she came to be acknowledged as one of the greatest actresses. In her tours in Germany, America, England and France, she was received with the greatest enthusiasm, especially in the rôles Juliet, Marguerite and Francesca da Rimini. Several of D'Annunzio's plays were written for her, and in these she met with her greatest success.

DUS′SELDORF, GERMANY, a city of the Rhenish province in Prussia, on the right bank of the Rhine, twenty-two miles north of Cologne. It is one of the handsomest cities in the valley of the Rhine, and is divided into four sections. It is a great focus of railway and steamboat communication and has a number of handsome public buildings and several remarkable churches. The town hall dates from 1587. Among the public institutions, the Academy of Art is of special interest. Düsseldorf has the honor of having founded a school of painting, which takes the name of *Düsseldorf* and has had a large number of distinguished pupils. The Hofgarten is one of the finest public gardens in Germany. The industries include the manufacture of iron goods, cotton, leather, tobacco, carpets and chemicals, and the trade is large. Early in 1919 the city was the scene of serious disorders in connection with the uprising of the radical elements (see WORLD WAR; GERMANY). Population, 1910, 358,728; in 1918, 449,643.

DUST, ATMOSPHERIC, consists of floating matter held in suspension in the air and particles carried into the air by the wind. Even when the air is fairly clear there are at least 8,000 dust motes to the cubic inch, and this is about one-fourth the number present when the air is hazy. Flying dust particles which the winds carry about are never higher than a few hundred feet in the air, but the tiny dust motes of the upper atmosphere are found miles above the earth. A large part of these motes have their origin in volcanic eruptions; another important source of supply is the outpouring of countless chimneys. Other dust motes are bits of sand, and planetary dust gathered from space by the earth.

The dust of the lower atmosphere plays an important part in changing the surface of the earth. Much of the sediment which causes the overflows of the Hoang River, in China, is wind-blown dust. Flying dust and wind-blown sand level off surfaces of plains, fill up valleys, modify coast lines and otherwise affect the contour of the earth. Dust particles in the air also have an important relation to rainfall, as each particle serves as a nucleus about which a drop of mist gathers. Masses of mist form clouds, and when condensation takes place there is a fall of rain. Dust is also an agent in the spread of disease, since flying particles may carry about germs that cause sickness. Washing, oiling or tarring streets and roads when there is much dust in the air is a safeguard.

DUTCH EAST INDIES, a name given to the Dutch possessions in the Malay Archipelago, comprising Sumatra, Java, Madura, Riau Lingga, Billiton, Celebes, Moluccas, Bali and many minor islands, with parts of Borneo, Papua and Timor. The capital is Batavia. The total area is estimated to be 683,000 square miles, and the population, (1920), 49,000,000.

DUTCH GUIANA, *ge ah'nah*, called in the homeland SURINAM, is a colony on the Atlantic coast of South America, belonging to the Netherlands. Brazil is south, British Guiana is west, and French Guiana is east. The area is 46,060 square miles—about equal to that of Mississippi; in 1921 it had a population of 113,181, not including negroes and forest Indians. About one-third of the people live in Paramaribo, the capital city, whose population was 38,191 in 1911. The language is Dutch; there is entire religious freedom. Government is in the hands of four councilors, appointed by the sovereign of the Netherlands. The country lies slightly north of the equator, and the agricultural products are such as are found in all warm climates. The principal sources of income are from sugar, bananas, cacao, rice, rum and molasses. Corn grows in the higher altitudes.

The Netherlands acquired this territory from England in 1667 in exchange for New Netherlands (now New York) in North America. Since then it has reverted twice to England, but in 1814 Netherland's claim was confirmed by the London Convention, at the close of the Napoleonic wars which sent the "Little Corporal" to Elba.

DUTCH METAL, an alloy containing 84½ parts copper and 15½ parts zinc. It has a fine golden-yellow color, is ductile, malleable and tenacious. When beaten out by a process analogous to that for gold leaf, until the sheets are less than 1–50,000th part of an inch thick, it constitutes Dutch leaf, or Dutch foil, and is used instead of gold leaf for ornamental purposes.

DUTIES. See TAX; CUSTOMS DUTIES; INTERNAL REVENUE.

DVINA, *dve nah'*, a river which rises in Northern Russia and flows in a general northwesterly direction, into the White Sea at the Gulf of Archangel. At Archangel, before it separates into four estuaries, it is four miles broad. It is navigable as far as Suchona, and is connected with the Volga by canal. The length of the river is 760 miles.

DVINSK, *dveensk*, the Russian name for Dünaburg (which see).

DVORAK, *dvor'zhahk*, ANTONIN (1841–1904), a Bohemian composer, born in Müllhausen. He studied at the Prague Conservatory and at Vienna. Much of his life was spent in England and in the United States. From 1892 to 1895 he was director of the National Conservatory in New York. While in America he became interested in negro and Indian melodies, and some fine expressions of these are to be found in his works. His compositions include symphonies, operas and sacred compositions, among the last the best known being *Stabat Mater* and *Requiem Mass*. With Smetana he stands at the head of Bohemian composers.

DWARF, a term applied to any animal or plant greatly below the usual size of its kind, particularly to an unusually small human being. Accounts of dwarf tribes in Africa have been common from early times, and it would appear from the accounts of Du Chaillu, Schweinfurth and other travelers that there are several dwarfish tribes throughout that continent. Chief among these are the Akka dwarfs of Central Africa; and a race is said to exist in the Congo, not as a distinct community, but mixed with other tribes.

Individual dwarfs occur in all races and were formerly a fashionable appendage to the courts of princes and the families of nobles. Jeffery Hudson, the favorite dwarf of Charles I, at the age of thirty is said to have been only eighteen inches high, though he afterward grew to three feet nine inches. Bébé, the celebrated dwarf of Stanislas of Poland, was thirty-three inches; Wybrand Lolkes, a Dutch dwarf, when sixty years of age was only twenty-seven inches; Francis Flynn—"General Mite"—was only twenty-one inches at sixteen. The best-known dwarf of modern times was Charles H. Stratton—

"General Tom Thumb"—who at the age of twenty-five was thirty-one inches in height. Unlike giants, dwarfs usually show no signs of mental weakness and are often, on the contrary, exceptionally bright. They are in many cases, too, perfectly proportioned; but some physical abnormality usually accompanies dwarfism.

DWARFING, the process of training up trees or shrubs for ornament in houses, so as to cause them never to reach more than a very small size, by keeping them in poor soil, giving them little water and pinching off strong shoots. Formerly dwarfing was practiced only by the Chinese and Japanese, for producing ornamental shrubs, but it is now common among fruit growers and on coffee plantations. Fruit trees are often dwarfed by grafting the cion upon a slow-growing trunk. Coffee trees are kept trimmed to increase the number of small branches upon which the fruit is borne. See GRAFTING.

DWIGHT, TIMOTHY (1752–1817), an American divine, born in Massachusetts. His father was Col. Timothy Dwight, and his mother a daughter of Jonathan Edwards. He served as chaplain in the Revolutionary army and ultimately became president of Yale College. His *Theology* (1818) was for long a standard, both in Great Britain and America. He was the author of two poems the *Conquest of Canaan* and *Greenfield Hill*, besides numerous unimportant works, consisting of dissertations and occasional sermons. A grandson, Timothy Dwight, was elected president of Yale in 1886 and was a member of the American committee for the revision of the English version of the Bible.

DY'AKS, the aborigines of Borneo, inhabiting the interior of the island. They are a finely formed race, of a yellow complexion, and are described as docile, industrious and superior to the Malays, whom they exceed in stature and often in good looks. The more advanced of them practice agriculture and live in neatly-constructed and fairly-comfortable houses. Hunting their enemies to make trophies of their heads was formerly a favorite pastime among them, but this has been abolished where European influence prevails.

DYEING, *di'ing*, the art of fixing a new and permanent color on textile fabrics, usually cotton, linen, silk and wool. All fabrics must be thoroughly cleaned before being placed in the dye. Cotton and linen fabrics go through a prolonged series of operations in bleaching. Silk is boiled in a solution of fine soap to remove the fatty matter, and wool is cleansed by scouring in weak soap or soda lye or weak ammonia.

The process of dyeing varies much according to the stuff and the coloring matters used. In general, animal fibers, like silk and wool, combine more easily with most colors than vegetable fibers, such as linen and cotton. In the case of the former, for example, a simple immersion in aniline dyes is sufficient to produce a fixed color. Some dyes will not unite directly with the fibers so as to produce a good and permanent color. These dyes require the intervention of another agent to fix them on the different stuffs, and the name *mordant* is applied to those substances which are employed to make the stuff to be dyed and the dyeing color combine. Alum, acetate of alumina, chloride of tin, salts of iron, albumen, gluten and tannin are common mordants. The mordant is generally dissolved in water, into which the stuffs to be dyed are plunged. In some cases it is mixed with the color, and both are applied to the stuff at the same time. An important characteristic of mordants is their power of affecting the natural tint of the dye and thus enabling a variety of shades to be produced at small expense. Thus, nitrates tend to give a yellow tinge to the colors; alumina deepens and oxide of tin brightens the natural tints.

Dyestuffs, the materials from which different colors are obtained. They are divided into two classes, natural and artificial. Among the former are indigo, safflower, annatto, cochineal, logwood and fustic. Of much greater commercial importance than any natural dyestuff is coal tar, the source of aniline dyes. It was announced in 1917 that a method had been discovered and patented for using the colors of autumn leaves for dyes. In Argentina a new dye material called *algarrobin* was used for dyeing khaki cloth. This was made from the wood of the carob tree.

The American Dye Industry. Previous to the World War Germany had a monopoly of the coal-tar industry, as only German manufacturers understood the process of converting the products of coal-tar distillation into the "intermediate" substances from which the dyes were made. In America the industry was represented by a few scattered establishments in which the imported intermediates were assembled into finished dyes. The outbreak of the war and its prolongation changed the situation completely.

When the German merchant marine was driven from the seas and importations from Germany ceased, American manufacturers were thrown on their own resources. As a result the independent American dye industry came into being, and the period of dependence on German products was at an end. By the first of January, 1919, $100,000,000 had been invested in the dye industry in the United States, and 200 dyes had been created from American raw materials and intermediates. These dyes are in every respect the equal of the foreign pre-war products. Experiments are still being made, and in time all shades will be produced on a commercial scale. The ending of the war made the outlook especially promising, and in 1920 America manufactured $54,000,000 worth of natural dyestuffs and extracts.

Related Articles. Consult the following titles for additional information:

Alizarin
Aniline
Annatto
Bleaching
Carmine
Coal Tar
Cochineal
Galls
Indigo
Logwood
Mordants
Safflower
Sloe
Turmeric
Wood

DYNAM'ICS, that branch of physics which deals with the laws of force. Dynamics is usually divided into *statics,* which treats of force that does not result in motion, and *kinetics,* which treats of force resulting in motion.

All physical force is subject to the same laws and principles, and accordingly can be measured. There are two units by which force is measured. These are the *poundal,* used in the English system of weights and measures, and the *dyne,* used in the metric system (see DYNE; POUNDAL). Force is measured by its effect upon mass. The resistance which a body offers to force is directly proportional to its mass. For instance, a body that weighs ten pounds will offer ten times the resistance that a body weighing one pound will offer. This is expressed in the following maxim:

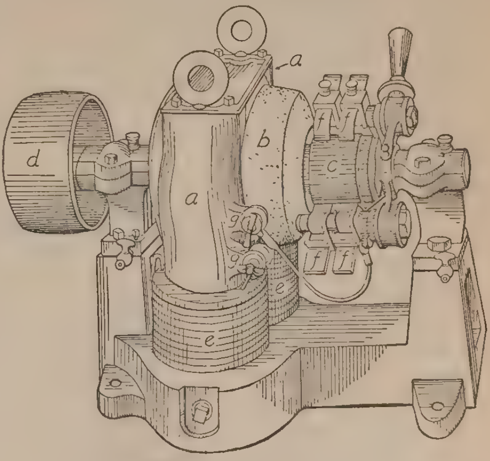
> The velocity produced in a body free to move without resistance in a unit of time will be directly proportional to the intensity or amount of the impressed force and inversely proportional to the mass of the body.

The science of dynamics is founded almost entirely on three principles, known as Newton's Laws of Motion. These are:

> (1) body at rest remains at rest, and a body in motion moves with a uniform velocity in a straight line, unless acted upon by some external force.
>
> (2) A given force will produce the same effect, whether acting upon a body in motion or at rest, whether the body is acted upon by that force alone or by others at the same time.
>
> (3) The action of every force is accompanied by an equal reaction in the opposite direction.

DY'NAMITE, an explosive substance, made by soaking wood pulp, infusorial earth, guncotton or other absorbent material in nitroglycerine. The most powerful variety is made by dissolving cellulose nitrate in nitroglycerine, and mixing the solution with wood pulp and a little potassium nitrate. This variety is put up in cartridges, in the form of sticks eight inches long and one and one-half inches in diameter. Dynamite is used under various names, such as giant powder, rend-rock and Hercules powder. It is employed in blasting. This explosive was invented by A. Nobel in 1886. Though its force is thirteen times that of ordinary gunpowder, it is surpassed in power by others of more recent discovery. See EXPLOSIVES.

DYNAMO, *di'na mo,* or **DYNAMO ELECTRIC MACHINE**, a machine for generating electricity by the expenditure of mechanical energy. It is so constructed that when driven by mechanical power (*d* in the illustration) an electro-motive-force is developed in the machine. The necessary parts of a dynamo are a field magnet, an armature and a commutator.



MODERN DYNAMO

a, field magnet; b, armature; c, commutator; d, wheel for belt; e, field coils; f, brushes; g, terminals.

The *field magnet* is a permanent magnet, used to produce the area of magnetic energy (see *a* in illustration). It is similar to a horseshoe magnet, except that it is larger, and consists of coils of wire wrapped around iron cores. The passage of a continuous current through these coils produces a powerful magnetic movement between their poles (*e* in illustration). The field coils are marked *h* in the illustration.

The *armature* is a core of soft iron susceptible to magnetization, on which insulated wire is wound. It is supported in bearings on each end and is revolved by a belt upon a pulley (see *d*). It rotates within the field magnets, and is the active principle in the generation of the electric current and in the distribution of electric power. (See *b* in illustration.)

The *commutator* is an apparatus used on dynamos, motors and induction coils for changing the direction of a current. It consists usually of a ring of copper segments insulated from one another by strips of a non-conducting material, the segments being connected electrically with the conductors by any one of several arrangements. (See *c* in illustration.)

Copper brushes (*f* in the illustration) bear upon the surface of the revolving commutator at diametrically opposite points; the continuous electro-motive force of the armature is delivered to these brushes and from them to the main terminals of the machine (*g, g*), from which the electric power is carried on wires to furnish electrical power.

The voltage (see Volt) of a dynamo depends upon the speed at which it is rotated, upon the strength of the magnetic flow and upon the number of turns of wire in the armature.

The above description applies to a simple dynamo. All are constructed on the same principle. The largest dynamos in America are in New York City, of 12,000 horse power. In Niagara Falls, N. Y., there are dynamos of 5,000 horse power; the mechanical power (applied at *d* by belting in the illustration) is furnished by the rushing waters of Niagara Falls. In Keokuk, Iowa, the great dam furnishes mechanical power for 11,000 horse power dynamos. See Electro-Motive Force; Electricity; Horse Power.

DYNAMOM′ETER, a device for measuring force exerted, as by an animal or a machine in doing work. One sort of dynamometer consists of a spring balance, fitted with a scale and an index. If the instrument were hung up and weights suspended on it, the weight would be shown by the indicator. Made a link in the draught chain of a plow, the dynamometer indicates in the same way the intensity of the strain, or horse power expended. The instrument can be made to measure not only force, but also the distance through which it acts and the time during which it is exerted.

DYNE, a unit of force, used when the metric system is employed for measuring force. In physics it is generally known as the unit of the centimeter-gram-second system, according to which a force acting upon one gram of matter for one second will give it a velocity of one centimeter per second. The dyne is too small a unit for common usage; the megadyne, equal to one million dynes, is employed instead. See Dynamics.

DYSODILE, *dis′o dile,* a yellowish mineral, found in limestone. When ignited it burns and emits a bad smell. It is closely related to amber.

DYSPEPSIA, *dis pep′si a,* a distressing ailment that afflicts a large portion of the human race with varying degrees of severity. It is another name for indigestion, and means, literally, *hard to digest.* Its causes are numerous—overeating, eating too fast, eating too much of one kind of food, indulging in too rich a diet, constipation, worrying while at the table, etc. Headache, nausea, a feeling of weight in the stomach and cramps are common symptoms. A dyspeptic person must find the cause of his trouble and then change his habits. Eating slowly, selecting a well-balanced diet of well-cooked, simple foods, dismissing cares from the mind while eating, avoiding tea, coffee and liquor and observing moderation in all things are good rules to follow. Serious cases should have the attention of a reliable physician, but a person can often cure himself by observing a few sensible rules. Good management of habits is as effective as medical treatment.

Related Articles. For suggestions regarding the properties of food and other topics bearing on the subject consult the following titles:

Calorie
Carbohydrate
Constipation
Cookery
Diet
Digestion
Domestic Science
Fletcherizing
Food
Mastication
Physical Culture
Physiology

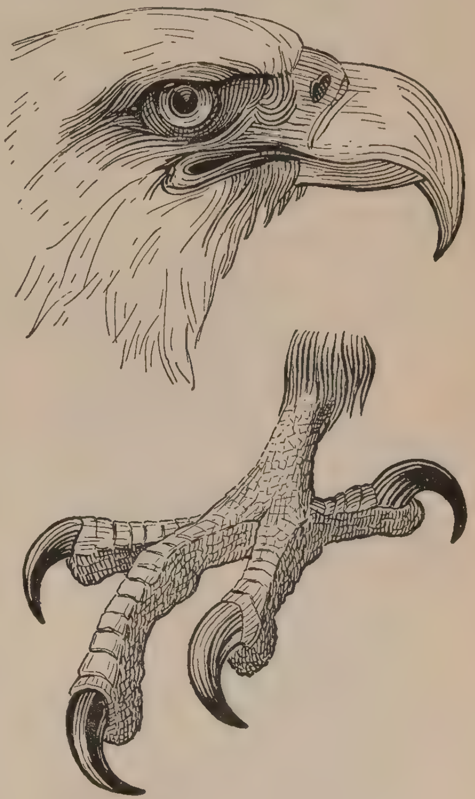
E

E, the second vowel and the fifth letter of the English alphabet. It occurs more frequently in English words than any other letter of the alphabet. In English its long or natural sound, as in *me,* coincides with the sound of *i* in the Italian and French languages. It has also another principal sound, a short one, heard in *met, men.* It has, besides, a sound like *a* in *bare,* as in *there,* and the obscure sound which is heard in *her.* As a final letter in English it is generally silent, but it serves to indicate that the preceding vowel is to have its long sound, as in *mane, cane, plume.* When two *e*'s come together the sound is generally the same as that of the single *e* long, as in *deem, esteem, need.* In form it is almost the same as in the earliest Greek.

In music, E is the third note in the diatonic scale of C.

EADS, *eedz,* James Buchanan (1820–1887), an American engineer, born at Lawrenceburg, Ind. He became famous for his skill in designing and constructing of the famous Eads Bridge over the Mississippi River, connecting Saint Louis and East Saint Louis. It is considered one of the finest bridges in the world. Following this was his construction of the jetties at the mouth of the Mississippi, by which the channel of the river was kept clear to a depth sufficient to permit the navigation of the largest ocean-going vessels. This was a new departure in American engineering and met with disfavor at first, but Mr. Eads's faith in his plan was so great that he offered to build the jetties at his own expense upon the condition that should they be satisfactory he should be paid for the work. They met every expectation. He was the first American to receive the Albert medal, conferred by the British Society for the Encouragement of Arts, Manufactures and Commerce. See Jetty.

EAGLE, *e′g′l,* a bird of prey which has been invested with a historical and literary background and a halo of romance. It is related to the hawks and the falcons. The name has become a synonym for strength, endurance and majesty. In a measure its reputation is deserved, yet it is not the most powerful of birds; it has not the keen vision of some others; its habits are not always those popularly associated with the noblest of birds.



HEAD AND FOOT OF BALD EAGLE

"Bird of the broad and sweeping wing,
Thy home is in high heaven,"

says Percival, in *To The Eagle,* thus crediting the bird with wondrous power of flight; it flies to greater heights than any other bird except the condor. In point of courage the eagle probably has no equal in all the feathered family, and it is this characteristic, combined with long life, majestic mien and piercing eye, which since ancient times has given it attributes of greatness.

So high does the eagle soar that the old Romans fancied it to be a messenger from the gods, so they placed it at an early date upon their national standards (see EAGLE, military standard). Milton, in *Paradise Lost,* voiced the Roman legend in

"The bird of Jove, stoop'd from his aery tour."

The eagle, on the other hand, is a thief. No objection exists to diet of rabbits and other small wild animals, but it swoops down upon agricultural districts and carries poultry and even lambs to his nest. It has been known to attack even larger animals. Then, too, the eagle, like the condor, eats dead and decaying flesh, but lacks much of the foulness of the latter bird. It searches for dead fish along shores of lakes and ocean, and often robs other birds of fish they have caught. The nest is built coarsely of sticks, on crags on rocky ledges, nearly always inaccessible to man, and two or three dull-colored eggs are laid.

GOLDEN EAGLE

Kinds of Eagles. Birds of the typical genus have long and powerful bills, the upper mandible curved sharply over the lower, have wings reaching to the tip of the tail and legs feathered to the toes. The *golden eagle* is common through Europe, Asia and northern Africa. It measures over six feet from tip to tip of the expanded wings, and three feet from the beak to the end of the tail. The body is brownish, the feathers of the head and neck pointed and of a golden hue. The national emblem of the United States is the *bald eagle,* one of the fishing eagles, which takes its name from the fact that in mature birds the head and neck are white. It is a handsome animal which has an air of great nobility, especially upon the wing. If left undisturbed, bald eagles will return to the same nest year after year.

Eagles live to an average age of a hundred years.

EAGLE, a gold coin of the United States, of the value of ten dollars. It was first coined in 1795. There are also half-eagles, quarter-eagles and double eagles, of proportionate values. The $2.50 gold coin is no longer minted.

EAGLE, THE, as a military standard made its first appearance in Persia, where it was borne on the top of a spear. The Romans, who adopted the emblem in 104 B. C., made similar use of it. Their eagle was about the size of a pigeon and was sometimes made of gold, sometimes of silver. The national emblem of the United States, the bald eagle with wings extended, was adopted in 1785.

EAMES, *aimz,* EMMA (1867–), whose family name was EMMA HAYDEN, is an American operatic soprano, born in Shanghai, China. She was taken to America in 1872, and later she studied music in Boston. After thorough study subsequently in Paris she made her début there as Juliet, in 1889. Two years later she married Julian Story, an artist. Her beauty, stage presence, fine acting and superb voice made her one of the most conspicuous operatic figures of the last generation. She has retired from the stage.

In 1907 she was divorced from Story, and four years later was married to the baritone Emelio de Gogorza. Her home for several years has been in Bath, Me.

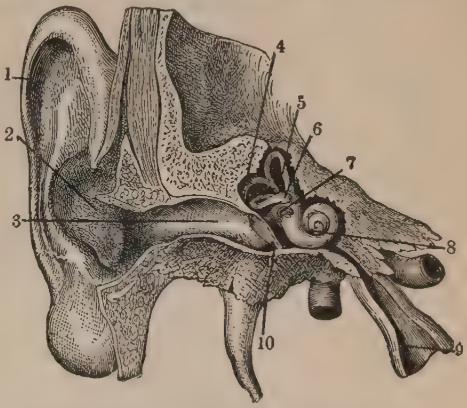
Never do this

EAR, *eer,* the organ of hearing, a wonderful mechanism that is one of the most precious possessions of mankind. Not until a person has lost the sense of hearing does he realize what that sense means to his daily comfort and happiness. To live in absolute silence is to be cut off from a great part of the ordinary intercourse of human beings. It is therefore of practical value to understand the mechanism of the ear, and to know how to protect this organ from injury. In man and all higher orders of animals the ear consists of three divisions, the external ear, the middle ear and the internal ear.

The External Ear, or **Concha,** consists of the auricle, or visible ear, and the auditory canal. In many animals the external ear is movable, but in man it is usually immovable in so far as voluntary movement is concerned. The human external ear consists of cartilage, skin and a thin, muscular coat and has a peculiar form. The outer rim is known as the *helix,* and the structure is so shaped as to attract sound waves into the auditory canal, which is a passage leading to the membrane separating the external from the middle ear. This is known as the membrane of the *tympanum* or eardrum, and is a circular membrane stretched across the inner end of the auditory canal, its rim being attached to the bone forming the walls of the tympanum. The membrane contains a number of muscles, some of which are joined to the bones of the middle ear, and its inner surface is lined with a mucous membrane.

The Middle Ear, or **Tympanum,** is a cavity filled with air, which enters it through the Eustachian tube. It contains three small bones known as *ossicles.* From their peculiar shape these bones are called the *hammer,* the *anvil* and the *stirrup.* The hammer consists of a head, neck and handle, the last being attached to the eardrum. The anvil has a concave surface into which the head of the hammer fits, and the stirrup at one end is joined to the anvil, and at the other to the vestibule of the internal ear. These bones are so placed as to transfer the vibrations of the eardrum to the internal ear.

The Internal Ear, or **Labyrinth,** is located in a small cavity in the temporal bone, and is divided into the vestibule, the semicircular canals and the cochlea. The vestibule is a small triangular cavity between the semicircular canals and the cochlea. The base fits into the opening which connects this with the middle ear. The *semicircular canals* are three in number and occupy vertical, oblique and horizontal positions, as shown in the diagram. Each connects with the vestibule by two openings. The *cochlea* or *snail shell* is a gradually tapering canal winding two and one-half times around a central bony axis. The cavity of the cochlea is divided into two passages by a structure called the *basilar membrane.* Supported on this is the so-called *organ of Corti,* which is formed of cells and rods which extend throughout the cochlea. The organ of Corti and the membrane form a series of vibrating cords equipped with an apparatus by which vibrations from the bones of the ear are transformed into nerve impulses. The cords are very delicately adjusted, and they respond to vibrations that range in speed from thirty to about 20,000 per second.



SECTION THROUGH RIGHT EAR

1, helix; 2, concha; 3, outer passage; 4, 5, 6, semi-circular canals; 7, oval window; 8, cochlea; 9, Eustachian tube; 10, eardrum.

Hearing. Hearing involves both physiological and mental action. For the production and transmission of sound, see SOUND. The external ear collects the sound waves and reflects them to the auditory canal, where they strike against the eardrum, which they cause to vibrate. By means of the bones in the middle ear the vibrations of the eardrum are

Outline on the Ear

I. FUNCTION
II. POSITION
III. ANATOMY
  (1) External ear or concha
    (a) Shape
    (b) Composition
      (1) Cartilage
      (2) Muscular coat
      (3) Skin
    (c) Parts
      (1) Helix
      (2) Tragus or protecting flap
      (3) Lobule
    (d) Functions
      (1) Collect sound waves
      (2) Concentrate them on eardrum
  (2) Middle ear or tympanum
    (a) Situation
    (b) Size
    (c) Parts
      (1) Membrane or eardrum
        (a) Position
        (b) Composition
        (c) Function
      (2) Cavity
        (a) Filled with air
        (b) Ossicles
          (1) Number
          (2) Names
          (3) Arrangement
          (4) Action
          (5) Function
      (3) Eustachian tube
        (a) Definition
        (b) Function
    (d) Function
      (1) Transmission of vibration to internal ear
  (3) Internal ear or labyrinth
    (1) Divisions
      (a) Vestibule
      (b) Semicircular canals
      (c) Cochlea
        (1) Basilar membrane
        (2) Organ of Corti
IV. PROCESS OF HEARING
  (1) Sound waves collected
  (2) Reflected to auditory canal
  (3) Concentrated against drum
  (4) Transmitted to internal ear
  (5) Action of organ of Corti
  (6) Work of auditory centers in brain
V. CARE OF THE EAR

Questions on the Ear

What is the ear?

What is the external ear? What separates it from the middle ear?

What substances make up the outer ear?

What are its important parts? Describe each.

What are its functions?

Describe the eardrum and the manner in which sound is transmitted to the middle ear.

Name the three bones of the middle ear.

Describe their action.

Where is the middle ear?

What is the Eustachian tube?

What is the internal ear?

What is the cochlea?

What is the function of the semi-circular canals? How are they connected with the vestibule?

What is the organ of Corti?

Of what is it composed?

Trace the transmission of sound from the outer ear to the brain.

What kind of an act is the final act of hearing?

State three ways of influencing the propagation of sound to the tympanum.

What are the names of the nerves of hearing?

Of what use is the fluid in the internal ear?

What parts of the inner ear operate in the same way as the strings of a piano?

What regulates the tension of the eardrum?

How are we enabled to recognize such a variety of sounds?

What is the educational value of training the sense of hearing?

How does the study of instrumental music develop the sense of hearing?

intensified and at the same time transmitted to the internal ear at the vestibule. Here they set up vibrations in the fluid. The strings and rods in the organ of Corti, which can vibrate in harmony with these vibrations, respond just as do the strings of a piano that produce a note sung near the instrument. The vibrations in the organ of Corti stimulate the sensitive fibers of the auditory nerve connected with the vibrating rods, and the nerve impulses thus created are carried to the auditory centers of the brain, by which they are translated into sound. Hence, the final act of hearing is a mental act.

The muscles of the middle ear regulate the tension of the eardrum so that it can respond equally well to vibrations that produce high or low tones, and the large number of rods and pillars of the organ of Corti enable us to recognize a multitude of sounds.

Care of the Ear. The internal apparatus of the ear is one of the most delicately-adjusted structures in the body, and one that should be carefully protected. The ears of children should be watched for signs of trouble. Earache and running ear, common ailments of childhood, should not be neglected, nor should home remedies be attempted. Many children have suffered irreparable injury because of neglect. Ear specialists should be consulted in all such cases, and especially after attacks of measles or scarlet fever. These diseases are the source of countless cases of deafness. Colds and nasal catarrh are also responsible for much ear trouble. They cause catarrh of the middle ear, which is one of the most difficult ailments to check. Children should be warned, also, not to pick their ears with sharp instruments, or to put their fingers in the ear. Boxing the ears of children is one of the most harmful practices known, as a severe blow may break the eardrum.

EARL, *url,* a nobleman in Great Britain, originally the viceroy of one of the four medieval divisions of England. The title to-day is simply honorary, signifying noble rank, and carries no jurisdiction. The king can bestow the rank on any deserving subject. The earl ranks below the marquis and above a viscount. It corresponds to the *comte* in France, which is the equivalent of the old Norman *count,* and therefore the wife of an earl is called *countess.*

EARLY, *ur′ly,* Jubal Anderson (1816–1894), an officer in the Confederate army. He was born in Franklin County, Va., and was graduated at West Point in 1837. He served in the Florida and Mexican wars, then adopted the law as a profession and was a member of the state legislature. Although firmly opposed to secession, he was true to his state and entered the Confederate army as colonel. At the first battle of Bull Run he was instrumental in saving the day for the Confederates, and he fought in the battles of Fredericksburg, Chancellorsville and Gettysburg. He also commanded in the Shenandoah Valley, where he was defeated by Sheridan. His lack of success compelled General Lee to remove him from command, but many military critics place him next to Lee and Jackson among the Confederate soldiers.

EAR′RING, an ornament of very ancient origin, worn on the ear. Earrings were worn by ancient Egyptians, Assyrians, Greeks and Romans. Among the earliest people they were restricted to royalty of both sexes and were a sign of rank. Among the Greeks and Etruscans they were commonly worn by women, and it is they who to-day monopolize the custom in every part of the civilized world where it still survives.

EAR SHELL. See Abalone.

EARTH, *urth,* the fifth in size among the eight planets of the solar system, and the only one about which we have detailed information. The earth is attended by one satellite, the moon, and is surrounded by a gaseous envelope, the atmosphere. Only Venus and Mercury among the planets are nearer the sun than is the earth.

Shape. To an observer whose view is not obstructed, any part of the earth presents itself as a circular and horizontal expanse, on the circumference of which the heavens appear to rest. Accordingly, in remote antiquity the earth was regarded as a flat, circular body, floating on the water. But even in antiquity the spherical form of the earth began to be suspected. It is only on this supposition that we can explain why the horizon of vision grows wider and wider the higher the position we choose, why the tops of towers and mountains at a distance become visible before the bases, why the hull of a ship disappears first as it sails away, and why, as we go from the poles toward the equator, new stars become visible. Besides these proofs there are many others, such as the circular shadow of the earth seen on the moon during an eclipse, the gradual appearance and disappearance of the sun, and, lastly, the fact that since 1519 it has been regularly circumnavigated.

The earth is not, however, an exact sphere, but is very slightly flattened at the poles, so as to have the form known as an *oblate spheroid.* In this way the *polar diameter,* or diameter from pole to pole, is shorter than the diameter at right angles to this—the *equatorical diameter.* The most accurate measurements make the polar diameter about twenty-seven miles less than the equatorial, the equatorial diameter being found to be 7,925.6 miles, and the polar, 7,899.14.

Surface Lines. The earth is regarded as divided into halves—the northern and the southern hemisphere—by the *equator,* an imaginary line passing around it midway between the poles. In order to indicate with precision the position of places on the earth, additional lines are imagined to lie on the surface in such a manner that those of one set all pass through both poles, while those of the other are drawn parallel to the equator. The former are called *meridians,* the latter *parallels of latitude,* and by them we can tell the latitude and longitude, and thus the exact position of any place on the earth's surface.

Density. Many experiments by various methods have been made in order to determine the average density of the earth, that is, the quantity of matter it contains, and from them it has been calculated that the density of the earth is about five and one-half times that of water.

Motions. The earth, in common with the other planets, moves around the sun, completing its revolution in about 365¼ days, our *common year;* or exactly 365 days, 9 hours, 9 minutes and $9\frac{8}{10}$ seconds, making the *sidereal year.* The orbit of the earth is an ellipse, with the sun in one of its foci. Hence, the earth is not equally distant from the sun in all parts of the year, but is about 3,000,000 miles nearer at one time than at another, its least distance, according to recent calculations, being 89,897,000 miles, its greatest 92,963,000, and the mean distance, or half the length of the long axis of the orbit, 91,430,000 miles. From this it may be calculated that the velocity of the earth in its orbit is about seventeen miles a second. In the winter of the northern hemisphere the earth is nearest the sun and in summer farthest from it; for the difference in the summer and winter temperature is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. The passage of the earth around its orbit causes the sun to appear to describe a similar orbit in the heavens; and hence it is that at one time of the year one group of stars is seen in the neighborhood of the sun at sunrise and sunset and at another time another group. This apparent path of the sun is the *ecliptic,* and corresponds with what would be the path of the earth as seen from the sun; and the groups of stars through which the sun successively passed form the *zodiac.*

The earth's daily motion about its own axis takes place, according to mean time, in twenty-three hours, fifty-six minutes and four and one-tenth seconds. The axis on which the earth performs its rotation is inclined towards the plane of its path about the sun at an angle of 23½°. The sun ascends in the heavens from March 21 to June 21 (the summer *solstice*), about 23½° above the equator toward the North Pole, and descends again toward the equator from June 21 to September 23; it then sinks till December 21 (the winter *solstice*), about 23½° below the equator toward the South Pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons and of the inequality of day and night attending them. For all countries lying beyond the equator, day and night are equal only twice in the year (at the *equinoxes*).

At the summer solstice the North Pole of the earth is turned toward the sun, and the South Pole away from it, and for 23½° about the North Pole there is a period of longer or shorter duration during which the sun is continually above the horizon for more than twenty-four hours, while round the latter is an equal extent of surface within which the sun for similar periods is below the horizon. The reverse condition holds at the winter solstice. The circles bounding these regions are called respectively the *Arctic* and the *Antarctic* Circle, and the regions themselves the *polar,* or *frigid, zones.* Throughout a region extending to 23½° on each side of the equator the sun is directly overhead at every point in succession twice in the year. The circles which bound this region are called the *tropics,* that in the northern hemisphere being the tropic of *Cancer,* that in the southern the tropic of *Capricorn,* while the region between is the *torrid zone.* The regions between the tropics and the polar circles are respectively the *north* and *south temperate zones.*

Surface. The surface of the earth contains over 196,000,000 square miles, of which over two-thirds consists of water. The land is arranged into masses of irregular shape and size, the greatest connected mass—Europe and Asia—being in the eastern hemisphere. The chief masses receive the name of continents; detached masses of smaller size form islands. The surface of the land is variously diversified, exhibiting mountains, valleys, plains, plateaus and deserts. The water area of the earth is divided into oceans, seas, bays, gulfs and sounds, while rivers and lakes may be regarded as features of the land surface. The great phenomena of the oceans are currents and tides.

Interior. From the evidence furnished by volcanoes, hot springs and the sinking of mines, it is known that the earth has a high internal temperature of its own. Taking the average of the various observed rates of increase, this temperature seems to increase 1° F. for every sixty feet of descent. Assuming this to continue, the rocks at a depth of two miles would be as hot as boiling water, and at a depth of fifty miles the heat would be such as at the surface would melt every known solid. This being so, various theories as to the internal condition of the earth have been proposed:

(1) That a thin envelope or crust surrounds a molten interior. It can be shown, however, that as tides must be produced in such a molten mass the cool outer crust would be unable to withstand the enormous force of these unless it were about 2,000 miles thick.

(2) That the interior is solid, with spaces here and there filled with liquid or gaseous material. This theory assumes that there are within the earth enormous cavities filled with molten rock, which escapes, when local pressure is removed, in the form of volcanic outbursts.

(3) That the earth consists of a thin crust, a large solid nucleus, and a liquid film between the nucleus and the crust; the temperature at the center being not much greater than comparatively near the surface.

(4) That the earth is solid to the center, but any part may become liquid if local pressure is removed.

We know that if the pressure on a solid be increased the melting point is correspondingly raised; now the pressure at the center of the earth, or even at the depth of fifty or one hundred miles, must be enormous, and probably is so great as to keep the rocks there permanently in a solid condition, notwithstanding the heat. This last theory is considered the most probable. On the supposition of its correctness, volcanoes might be explained by supposing that at certain points here and there pressure is removed by the elevations of portions of the earth's surface which are constantly taking place, and that this allows the rocks to liquefy. Water may then soak down to these liquid rocks, and, being converted into steam, produce various volcanic phenomena.

Origin. The earth is believed by some authorities to have condensed and solidified from a gaseous or nebular condition, and to have once had a far higher temperature than now. If such were the case the outer surface, losing heat by radiation, would be the first part to cool quickly; while the interior, losing its heat by conduction, would not cool so rapidly, and therefore would naturally have a higher temperature than the portion at the surface. The theory of condensation from a hot gaseous state is a part of the nebular hypothesis (which see), originated by Laplace. It is not accepted by several modern scholars, as it has many inconsistencies. A more recent theory as to the earth's origin is called the *planetesimal hypothesis.* Scientists advocating this theory hold that nebulae consist of swarms of small bodies, some of which move in regular paths, like planets. *Planetesimal* means *tiny planet.* When a number of these revolving bodies are brought close together they gradually collect into large, compact masses, which grow larger as they gather up other planetesimals. In this way, according to the theory, the earth and other planets were formed.

Magnetism. Another feature that the earth as a whole presents is magnetism. When a magnetic needle is balanced on a point it remains at rest in one position only, pointing then nearly due north and south. This can be explained only on the supposition that the earth acts as a great magnet. It has, in fact, two poles—a north and a south magnetic pole—which are not very far from, but by no means coincident with, the geographical poles. The north magnetic pole was located exactly in 1905. There is also a neutral line or magnetic equator, which does not greatly diverge from the geographical equator. The earth acts upon all magnets as they act upon one another, and it is for this reason that they point north and south.

Related Articles. Consult the following titles for additional information:

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Map
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Moon
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Ocean
Physical Geography (with list)
Poles
Polar System
Solstice
Standard Time
Sun
Tides
Time
Tropics
Weather Bureau
Zodiac
Zone

EARTH CURRENTS, natural electric disturbances of the nature of transient currents in the earth. Telegraph lines, and particularly long submarine lines, are constantly troubled by them. The origin and nature of earth currents are not thoroughly understood, but they are found to be very intimately connected with magnetic disturbances of the earth, called magnetic storms, and these, it is well known, are closely connected with the appearance of the aurora borealis and with the occurrence of spots on the sun. See AURORA BOREALIS.

EARTHENWARE. See POTTERY.

EARTH′QUAKE, a movement of the earth's crust, caused by some internal convulsion. Three kinds of earthquake movements are generally recognized. These are the wave movement, the vertical movement and the circular, or twisting, movement. The first is the most common and extends over the largest areas. The *wave* movement begins at a center, from which it moves in all directions, like a wave started by dropping a pebble into a pool of water. The earthquake wave, however, differs from the water wave in this: the irregular resistance which it receives from the different layers of rock prevents its moving in a circle, so that its outline soon becomes very irregular. The velocity is very great, often reaching thirty or forty miles a minute. These waves also move more rapidly in hard, elastic rock than in loose gravel or sand. The *vertical* movement acts like the explosion of a mine and usually throws masses of earth and rock into the air. The *circular* or *twisting* movement is the most destructive of all, but it is happily of least frequent occurrence and is confined to very small areas.

The causes of earthquakes are not well understood. Those in volcanic regions are evidently connected with volcanic action, and some are known to be caused by the eruptions which they precede; but those movements more or less remote from volcanic regions and extending over comparatively large areas, such as the earthquake at Charleston, S. C., in 1886, cannot logically be accounted for in this way. The most generally accepted view as to the cause of this sort of earthquake is that the movement of the earth's crust is caused by the contractions of cooling matter in the interior.

When the motion is violent and rapid, the destructive effects of an earthquake are very great. An upward movement of a quarter of an inch will crack brick walls, and one of half an inch will shatter them. When occurring on or near the seacoast, earthquakes often cause great destruction and loss of life by the unusually high waves which they produce in the sea. These roll inland and flood regions that under ordinary conditions are entirely free from the action of the sea. Sometimes large steamers are carried from their moorings and left upon dry land, buildings are destroyed, basins are flooded and hundreds of people are drowned. In some localities changes of level are produced by earthquakes, courses of streams are altered, springs are dried up and new springs are formed. Fortunately, most shocks are mild, and those of a severe nature seldom occur. The most noted earthquakes in the world's history are those at Lima in 1746; Lisbon in 1755, which caused the death of from 40,000 to 50,000 persons; Calabria in 1857; in Ecuador and Peru in 1868; at Charleston, S. C., in 1886; in Italy in 1887, and in Japan in 1891.

The most destructive earthquake in the United States occurred in San Francisco and its immediate vicinity April 18, 1906. A large portion of the business part of the city was destroyed or so damaged as to make rebuilding necessary. The destructive effects extended for 125 miles north and 80 miles south of the city. Several buildings of the Leland Stanford University were damaged or destroyed. The total loss of life was about 500, and over 1,500 people were injured. The total property loss was estimated at $350,000,000. On August 16, 1906, several shocks occurred in South America. Valparaiso, Chile, suffered serious damage and loss of life. Santiago and other towns in the vicinity were also more or less affected.

The greatest earthquake calamity known to history occurred in Calabria, Italy, and the island of Sicily on the morning of December 28, 1908. The cities of Messina, with a population of 100,000, and Reggio, with a population of 50,000, were destroyed, together with twenty or more smaller towns along the coasts of Calabria and Sicily. The loss of life was estimated at from 120,000 to 150,000. The nations of Europe and the United States were prompt in their responses for relief, the Congress of the United States appropriating $800,000 from the national treasury. This was supplemented by private donations, and over $3,000,000 was contributed by Americans. The cause of this earthquake is supposed to have been a landslip or fault break (see FAULT).

On January 13, 1914, occurred another great earthquake on the island of Sakura, Japan. A volcano which had been inactive for 150 years suddenly burst into activity, wiping out three towns and killing hundreds of people. In 1917 there were severe shocks in Central America. On June 7 the city of San Salvador, capital of Salvador, was nearly destroyed, and in December Guatemala City was completely laid in ruins.

EARTHS, a term applied to certain inodorous, uninflammable, insoluble substances, of a moderate specific gravity, which consitute by far the greatest part of the gravel and soil that go to make up the mountains, valleys and plains of our globe. They include lime, baryta, strontia, magnesia, alumina and a few others. For a description of the substances named, see their respective titles.

EARTH SHINE, in astronomy a name given to the faint light visible on the part of the moon not illuminated by the sun. It is most conspicuous when the illuminated part of the disk is at its smallest, soon after new moon, and is due to the light reflected upon the moon from the earth.

EARTHWORM, or **ANGLEWORM**, the popular name for long, creeping animals composed of many segments or rings, all of which are much alike. Earthworms represent about the lowest form of animal life. They move by contractions of successive parts of the body, aided by a double row of bristles on the under side. Their food consists of both vegetable and animal matter, and with it they swallow considerable soil. After digesting the food, they come to the surface of the earth and deposit the refuse and the soil in little heaps. Thus by turning the earth over and over, and by bringing fine rich soil to the surface, they are of great service to the farmer. When a heavy rain comes it fills the burrows and forces the worms to come to the surface. It is not true that they rain down. Earthworms are much used as bait by fishermen.

EARWIG, a name given in the United States to a small centipede, but more properly applied to an insect belonging to a group having leathery upper wings, gauzelike lower wings and long, delicate antennae, and armed on the abdomen with strong pinchers.

EARWIG
a, larva; b, pupa; c, perfect insect.

EASEMENT, *eez′ment*, a right of use or enjoyment of lands belonging to another which one may possess through ownership or possession of other lands. Such are rights of way, the right of light, the right of drainage. Common law classifies easements as *positive*, or *affirmative*, and *negative*. The former refers to the right of physical use of another's land, as a right of way, while the latter requires no such physicial use, as the right of light. If an easement is infringed or destroyed, the responsible party is guilty of a nuisance, and this may be abated by legal action or by the act of the person injured. If the offense does not amount to a nuisance, the offending party may be punished for trespass, while if the infringement is only threatened, an injunction may be issued to restrain the acts.

EAST′ER, the festival commemorating the resurrection of Christ, observed in many branches of the Christian Church. By the first Christians it was regarded as continuing the feast of the Passover, at which the paschal lamb, a symbol of Christ, was sacrificed. Hence its name in Greek and in the Romance languages is taken from the Hebrew *pesach,* meaning passover.

The English name comes from the Anglo-Saxon *Eostre,* a goddess of light or spring, whose festival was celebrated in April. There was a long dispute in the Christian Church as to the proper time for holding Easter, the Christians of the East celebrating it on the same day as that on which the Jewish Passover fell, that is the fourteenth of Nisan, while the majority of the Church celebrated it on the Sunday next after this day. The controversy was decided by the Council of Nice in 325, which fixed Easter on the first Sunday after the full moon which happens upon or next after March 21. If the full moon happens on a Sunday, Easter is the Sunday after.

EASTER LILY, a plant whose waxy-white flowers are much used in churches when the festival of Easter is celebrated. The Easter lily is a stately plant. The stem bears a profusion of long, pointed, green leaves, and the flowers grow straight outward from the stalk. The varieties seen most frequently in America were brought from Bermuda, China and Japan. Though the last two naturally bloom later than the Bermuda lily, florists force early blossoming in hothouses.

EASTERN QUESTION, the name given to the diplomatic and national interests affected by the gradual retrocession of the Turkish Empire in Europe, and the problem of disposing of the territory thus left. Bulgaria, Rumania, Serbia, Greece, and Albania are the new states which have arisen on the withdrawal of the Turkish power, and their history, with the respective policies of England, France, Austria and Russia toward them, is the history of the phases of the Eastern Question.

Each of the European powers has steadily sought to preserve its own influence in the Balkan peninsula and has tried to prevent the formation of a strong Balkan state which might resist its demands. For this reason the powers created the new autonomous state of Albania at the end of the Balkan Wars, instead of allowing Bulgaria and its allies to share the conquered territory among them. Instead of materially increasing the strength of each of the Balkan countries, the Balkan Wars merely gave each a few additional square miles and created a new state, even weaker than the rest. The Crimean War, the Russo-Turkish War of 1877–1878, the Armenian massacres of 1896, and the Turko-Grecian War of 1897, are among the other notable events connected with the Eastern Question, prior to the World War (1914–1919). For the settlement of the entire Eastern Question as the outcome of that struggle, see WORLD WAR.

EAST INDIA COMPANY, a trading company formed in London in 1590 and granted by the British government the monopoly of trade with India, China and the East Indies. The first charter, granted by Queen Elizabeth, conferred trading rights for a period of fifteen years. James I renewed the charter and made the right perpetual, reserving to the crown the right to recall it at three years' notice. Additional power was granted to the company of seizing and confiscating ships and goods of contraband traders, either in the British dominions or in any of the places where they were authorized to trade. The political rights which it held in India made possible oppressive rule there, and this led, in 1784, to the appointment of a Board of Control which supervised all acts of the company except the purely commercial.

In 1813 the charter was renewed, but this time the right to exclusive trade was confined to China, while the Indian trade was thrown open to all British subjects. The renewal of the company's charter again in 1834 took place in the face of stout opposition to their mercantile and even to their legislative privileges. In 1858 the government of India was vested directly in the Crown, and henceforth the Company existed only for the purpose of receiving payment of the dividends due upon capital.

EAST IN′DIES, the name loosely applied to India, Indo-China and the Malay Archipelago, including the Philippine Islands.

EAST LIVERPOOL, OHIO, in Columbiana County, forty miles northwest of Pittsburgh, Pa., on the Ohio River and on the Pennsylvania Railroad. It has extensive machine shops and glass factories, many china, porcelain and terra cotta works, and the largest potteries in the world. The place was settled in 1798 as Saint Clair, and incorporated under its present name in 1834. Population, 1910, 20,387; in 1920, 21,411, a gain of 5 per cent.

EASTON, Pa., the county seat of Northampton County, on the Delaware River at its junction with the Lehigh, sixty-five miles north of Philadelphia, on the Lehigh Valley, the Lackawanna, the Pennsylvania and other railroads. The city is connected by bridges with South Easton and with Philipsburg in New Jersey, and is built upon beautiful hills sloping toward the river. There is a central public square, and the chief buildings include a Carnegie Library, a fine Federal building, an opera house and the buildings of a number of educational institutions, chief among which is Lafayette College, a leading Presbyterian college, and Park Academy. The chief industries include smelting furnaces, machine shops, shoe factories, planing mills, flour mills, silk mills and factories for the manufacture of automobiles, pianos, organs and other articles. The city is in the vicinity of an important coal region, and has a large trade. Population, 1910, 28,523; in 1920, 33,813, a gain of 18 per cent.

EAST ORANGE, N. J. See Orange, N. J.

EAST RIVER, a strait in New York, separating Manhattan and Brooklyn boroughs, and connecting Long Island Sound with New York Bay. It is ten miles long, and from one-half mile to three and one-half miles wide. The famous Brooklyn Bridge spans this river, and it is crossed by three other great suspension bridges. The lower section of East River is a part of New York Harbor. See New York (city).

EAST SAINT LOUIS, Ill., the second city in size in the state, slightly larger than Peoria in 1917, in Saint Clair County, on the Baltimore & Ohio, the Chicago & Alton, the Wabash and seventeen other railroads, and on the Mississippi River, opposite Saint Louis, with which it is connected by the great Eads Bridge. Coal is mined in the vicinity, and among the very large number of industries are extensive rolling mills, malleable iron works, foundries, machine shops, locomotive works, grain elevators, fertilizer plants, glass factories and flour mills. The city contains one of the largest stockyards in the United States, and the packing industry is important. In 1896 the town was swept by a disastrous tornado entailing a loss of 500 lives and $10,000,000 destruction of property. The city has been the center of much labor agitation, culminating in 1917 in a very serious riot, in which a number of people were killed. It was occasioned by the importation of negro laborers from the South in large numbers. East Saint Louis was incorporated as a city in 1865 and has experienced a rapid growth since 1870. Population, 1910, 58,547; in 1920, 66,740, a gain of 14 per cent.

EAU CLAIRE, *o klair′*, Wis., the county seat of Eau Claire County, eighty-four miles east of Saint Paul, Minn., at the junction of the Eau Claire and Chippewa rivers and on the Wisconsin Central, the Chicago, Milwaukee & Saint Paul and the Chicago & North Western railroads. The city is at the head of light navigation on the Chippewa, and has good water power from both rivers. It is the outlet of the Chippewa lumber district and has extensive sawmills and pulp and paper mills. Eau Claire has a Carnegie Library, three hospitals and a Federal building. It is the seat of one of Wisconsin's normal schools. Population, 1910, 18,310; in 1920, 20,880.

EAU DE COLOGNE, *o de ko lone′*, a widely-used perfume, first made by an Italian who settled eventually in the German city of Cologne. It means, literally, *Cologne water*. The genuine perfume consists of purified benzoin, oil of lavender and oil of rosemary dissolved in alcohol, with various aromatic oils added until the desired fragrance is obtained. A number of excellent imitations are made in the United States.

EBENEZER, *eb e ne′zer*, a word derived from the Hebrew for *stone of help*. The name was applied by Samuel to a spot where he set up a stone in token of God's help in a battle with the Philistines (*I Sam.* VII, 10–12). *Ebenezer* has come to be used as a symbol to express recognition of divine assistance, as in the following lines from the hymn *Come Thou Fount of Every Blessing:*

> Here I'll raise mine Ebeneezer,
> Hither by thy help I'll come.

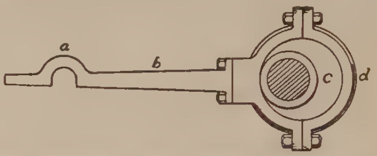
EBERS, *a′burs*, Georg Moritz (1837–1898), a German Egyptologist and novelist. His scientific publications include *Egypt and the Book of Moses; Egypt, Description, Historical and Picturesque,* and *From Goshen to Sinai.* He is, however, most widely known through his novels, the most popular of which are *An Egyptian Princess* and *Uarda*.

EBERT, Friedrich (1871–), a German of obscure origin, who became first President of Germany under the provisional constitution adopted in February, 1919. Ebert was born in Heidelberg, the son of a tailor, and learned there the harnessmaker's trade. After taking up journalism he became editor of a Socialist newspaper, and in 1900 was elected Socialist member of the city council of Bremen. In 1905 he was given a seat in the central executive committee of the Social Democratic party, and in 1910 was elected to the Reichstag, the lower house of the German Parliament under the empire. Ebert supported the government during the World War, but he opposed the imperialistic aims of the militarists and the Treaty of Brest-Litovsk, by which Russia was to be dismembered.

On November 9, 1918, he succeeded Prince Maximilian as Chancellor, and on November 14 became Premier of the new democratic Cabinet. As head of the government he opened the first German National Assembly, which convened at Weimar on February 6, 1919. On February 11 the Assembly elected him first President of Germany, after adopting a provisional constitution. President Ebert was called upon to guide the German state through a troubled period, for the revolution which overthrew the empire was followed by serious uprisings among the radical Socialists, or Spartacans. He authorized severe measures against the disturbers, and in March hundreds of the rebellious element were executed. See Germany.

EB′ONY, the name given to the heartwood of various trees of different species, similar in that they all have wood of a dark color. The most valuable is the heartwood of a tree which grows in great abundance in the flat parts of Ceylon and is of such size that logs of its heartwood two feet in diameter and from ten to fifteen feet long are often procured. Other varieties of valuable ebony are obtained from the East Indies. Ebony is hard, heavy and durable, and admits of a fine polish or gloss. The most usual colors are black, red and green. The best is jet black, free from veins, very heavy, astringent, and of an acrid, pungent taste. On burning coals it yields an agreeable perfume, and when green it readily takes fire from its abundance of gum. It is wrought into toys, piano keys and musical instruments, and is used for mosaic inlaid work and other ornamental purposes.

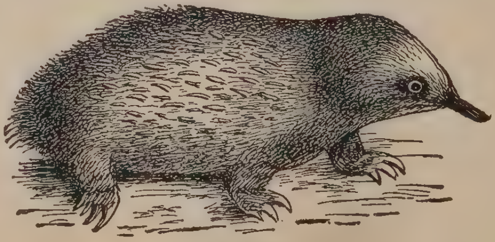
ECCENTRIC, *ek sen′trik*, a mechanical device for converting continuous circular motion into rectilinear motion. It consists of a disk attached to a shaft in such a way that the center of the disk does not coincide with the center of the shaft. On the circumference of the disk is a hook to which is attached a rod. As the shaft and the eccentric revolve the hook is alternately raised and lowered, imparting a forth and back motion to the rod.



ECCENTRIC AND ATTACHMENTS
a, hook or gab; b, rod; c, eccentric; d, strap.

ECCLESIASTES, *ek kle ze as′teez*, a book of the Old Testament, consisting of a series of discourses on the vanity of mortal things. The twelfth and last chapter begins with the famous admonition, "Remember now thy Creator in the days of thy youth," and contains a striking description of old age, written in language that is highly poetical. The title of the book is that by which the Septuagint translators rendered the Hebrew *Koheleth*, which means *preacher*. According to Jewish tradition, it was written by Solomon; but the best modern criticism has decided that its style and language, no less than its thought, belong to a much later date.

ECHIDNA, *e kid′nah*, or **SPINY ANT-EATER**, a genus of Australian toothless mammals, in size and general appearance resembling a large hedgehog, excepting that the spines are longer, and the muzzle is long and slender, with a small opening at the end through which a long, flexible tongue can be thrust. The echidna sleeps during the day.



ECHIDNA

It has short, strong legs and its five toes are armed with powerful claws so that it can burrow easily in the ground. It feeds upon ants and other insects, which it catches with its long, sticky tongue. It is nearly allied to the ornithorhynchus or duckbill, and the two form a peculiar class of animals, having in their structure some of the peculiarities that mark mammals, birds and reptiles.

ECHINODERMS, *e ki′no durmz,* one of the great divisions of the animal kingdom. The name means spiny-skinned, and was applied because of the long, needlelike projections on some species. Biologists rank them between insects and vertebrates. They include star fishes, brittle stars, sea urchins, sea lilies and sea cucumbers. The typical echinoderm has a disk-shaped body with arms which radiate like the spokes of a wheel, and it has a well-organized nervous system. The animal feeds through a round opening on the under side of the central disk on oysters, clams, seaweed and the like. There are about 3,000 species.

ECHO, *ek′ko,* in Greek mythology, a nymph who fell in love with Narcissus and because he did not return her love, pined away until nothing was left but her voice. See NARCISSUS.

ECHO, the repetition of a sound caused by the reflection of sound waves by some moderately even surface, as the wall of a building. The waves of sound on meeting the surface are turned back in their course. In order that the echo may return to the place from which the sound proceeds the reflection must be direct, and not at an angle to the line of transmission; otherwise the echo may be heard by others but not by the transmitter of the sound. This may be effected either by a reflecting surface at right angles to the line of transmission, or by several reflecting surfaces which end in bringing the sound back to the point from which it started.

Sound travels about 1,125 feet in a second; consequently, an observer standing at half that distance from the reflecting object would hear the echo a second later than the sound. Such an echo would repeat as many words and syllables as could be heard in a second. As the distance decreases the echo repeats fewer syllables, till only one is repeated. The most practiced ear cannot distinguish in a second more than from nine to twelve successive sounds, so that a distance of not less than sixty feet is needed to enable an ordinary ear to distinguish between the echo and the original sounds. At a near distance the echo only clouds the original sounds, and this often interferes with the hearing in churches and other large buildings. Woods, rocks and mountains often produce wonderful echoes, for which particular localities have become famous.

ECK, JOHANN MAIER VON (1486–1543), a celebrated opponent of Luther. When he was trying to confuse Luther with quotations from the church fathers and councils, Luther quoted history and Scripture and finally said, "You run away from the Bible like the devil from the Cross." Eck at last made Luther declare that under certain circumstances it might be right to disobey the Pope and council. Eck then went to Rome (1520) and returned with a Papal bull against Luther, in attempting to publish which he met with violent opposition. In 1530, while at the diet of Augsburg, he made the remarkable admission that he could confute the Augsburg Confession by the fathers, but not by the Scriptures.

ECLECTIC SCHOOL OF MEDICINE, a term applied to a group of American investigators in medical science who do not adhere exclusively to the practice of any one school, but select from each according to need. Medical eclecticism began in America in the early part of the nineteenth century. In 1826 an eclectic college was founded in New York. This was followed by a number of others, and in 1870 a National Eclectic Medical Association was formed. The eclectics, while thoroughgoing individualists, each choosing for himself between what he conceives to be the good and the bad, are agreed in the rejection of mercury and certain other minerals in medicine and in the use of native plants for medicinal uses.

ECLECTICS, *ek lek′tiks,* a name disparagingly applied to pseudo-philosophers who do not follow one system of philosophy in its entirety, but select from each what they find attractive. Those who are unable to follow an argument to its logical conclusion and thus piece together parts of several systems often are guilty of the most glaring inconsistencies. Every great philosopher exercises his selective insight, choosing his materials from all systems, but what distinguishes a great thinker from an eclectic is his desire to discover truth rather than that which he would like to believe true.

ECLIPSE, *e klips′*, the hiding of one heavenly body by another or by the shadow of another. Stars and planets may suffer eclipse, but the only eclipse visible to the naked eye are those of the sun and the moon.

An eclipse of the moon is occasioned by the interposition of the earth between the sun and the moon; consequently, all eclipses of the moon happen at full moon; for it is only when the moon is on that side of the earth which is turned away from the sun, and directly opposite, that it can come within the earth's shadow. Further, the moon must at that time be in the same plane as the earth's shadow; that is, the plane of the ecliptic in which the latter always moves. If the moon moved in the plane of the earth's path, there would be an eclipse every full moon, but as the moon's orbit makes an angle of more than 5° with the plane of the ecliptic, it frequently happens that though the moon is in opposition it does not come within the shadow of the earth. In the diagram (Fig. 1) it can readily be seen that to a person on the side of the earth away from the sun, the moon would be in total eclipse for some time. It may also be noticed that to a person on the moon the sun would be in partial eclipse.

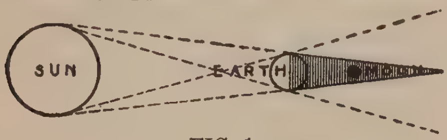


FIG. 1

An eclipse of the sun is the hiding of the whole or part of the sun by the moon as it passes between the earth and the sun; thus, all the eclipses of the sun happen at the time of the new moon. If the moon hides the whole face of the sun, the eclipse is *total;* if it hides but a portion of the face, the eclipse is *partial;* if all but a narrow ring is hidden, the eclipse is *annular.* The accompanying diagram (Fig. 2) will explain how an eclipse of the sun is caused. To a person standing on the earth between B and C the eclipse will be total; to one between A and B or between C and D the eclipse will be partial.

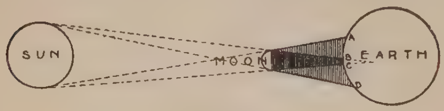


FIG. 2

An eclipse of the sun begins on the western side of its disk and ends on the eastern; and an eclipse of the moon begins on the eastern side of its disk and ends on the western. The average number of eclipses in a year is four, two of the sun and two of the moon; and as the sun and moon are as long below the horizon of any particular place as they are above it, the average number of visible eclipses in a year is two, one of the sun and one of the moon. Astronomers predict eclipses with absolute accuracy, and every year they announce where eclipses will be visible. In the United States total eclipses of the sun were visible in 1806, 1834, 1860, 1869, 1878, 1880, 1889, 1900 and 1918; others will occur in 1923, 1925 and 1945.

ECLIPTIC, *e klip′tik*, the sun's path, or the great circle in which the sun *appears* to describe its annual course from west to east. The ecliptic actually corresponds to the path which the earth describes. The Greeks observed that the eclipses of the sun and moon took place near this circle, whence they called it the *ecliptic.* The ecliptic has been divided into twelve equal parts, each of which contains 30° (see ZODIAC). The position of the planets and the latitude and longitude of the stars are reckoned by the plane of the ecliptic. The points at which the equator and ecliptic intersect are subject to a continual variation, receding westward at the rate of about fifty seconds a year. The angle at which the ecliptic stands to the equator is also variable, and has been diminishing for about 4,000 years at the rate of about fifty seconds in a century. Laplace showed, however, that this variation has certain fixed limits, and that after a certain time the angle will begin to increase again. The combined result of these two changes is to cause the pole of the earth not to point constantly to the same spot in the heavens, but to describe an undulating circle round a certain point. This movement, however, is so slow that it takes many thousand years to complete it.

ECOLE DES BEAUX ARTS, *a kohl′da bo zahr′*, meaning "School of Fine Arts," is the name of an art school in Paris supported by the French government. It was founded in 1648 by Mazarin and is to-day the most important institution of its kind in the world. Courses are offered in drawing, painting, sculpture, architecture, engraving and allied branches. The school of architecture is one of the most important departments. In 1666 the *prix de Rome* was instituted, and competitive examinations for this prize take place at the Ecole. The successful competitors receive an annual allowance from the government for three or four years, two of which must be passed at Rome. The competition is open to all artists between the ages of fifteen and twenty-five, whether they are pupils of the school or not. The school provides for about 1,300 students. There has always been a large attendance of Americans.

ECOLOGY, *e kol′o ji,* a name given to that department of botany which treats of plants in their relations to their surroundings, and which deals with such subjects as the distribution of seed, cross fertilization and the grouping of plants according to soil and climatic conditions. See CROSS FERTILIZATION; SEED DISPERSAL.

ECONOMICS, *e ko nom′iks,* the science which treats of the production, distribution and consumption of those things which man deems necessary for his comfort or happiness; that is, the things in general use. The term *economics* is replacing an older term, *political economy,* but the two are identical in meaning. Economics is a subject in which everyone has a vital interest. A man may go through life entirely ignorant of calculus, he may have only a superficial knowledge of botany or zoölogy, and he may be unable to pass a simple test in astronomy, but every day of his life he is directly applying some law of economics. The whole structure of modern civilization is built upon its laws. The paying of rent, the drawing of wages, the purchase of household commodities, the manufacture and wearing of clothing, the investment of capital and the starting of a savings account are all different phases of the science of economics.

A study of economics shows us that the human race is essentially one great family. In any community, no person can live unto himself. Even the hermit must come into contact with the world to the extent of obtaining his daily necessities, unless, indeed, he should live in the woods like a savage. Each community, in turn, is dependent upon other communities. If the coal miners in a certain section go on a strike, all the homes and industrial plants supplied by the mines in question are affected, and if the strike is protracted factories may have to close for lack of fuel. In a larger sense, nations are dependent upon one another for the necessities of life, a fact brought out very clearly during the World War and emphasized in the league of nations.

It follows, then, that free trade and tariff questions are important factors in world economics, for they have to do with the economic relations of one country to another. It has been argued by one group of economists, and controverted by another, that if universal free trade prevailed the chief cause of war would be removed, as all the nations would be brought into closer relations and the animosities aroused by protective tariffs would be done away with. Ethical and moral questions, as indicated above, enter largely into the study of economics. The relations of capital to labor, the question of the unequal distribution of wealth, the problems of competition, these and countless other subjects are being discussed from the standpoint of justice and the common good. While economics deals with practical things—the things that man eats and wears and enjoys—it is more and more being studied from an idealistic standpoint. It is in this respect that labor questions are now being examined.

Related Articles. Consult the following titles for additional information:

GENERAL

Annuity
Bimetallism
Blacklist
Bounty
Boycott
Budget
Capital
Child Labor
Communism
Conservation
Consumption
Coöperation
Corn Laws
Corporation
Credit
Customs Duties
Debt
Embargo
Employer's Liability
Factory and Factory Legislation
Famine
Free Trade
Gresham's Law
Income Tax
Inheritance Tax
Interest
Labor, Division of
Labor Legislation
Labor Organizations
Laisser Faire
Lockout
Minimum Wage
Money
Mothers' Pensions
National Debt
Old Age Pensions
Open Shop
Pauperism
Pension
Peonage
Population
Profit Sharing
Protection
Reciprocity
Rent
Single Tax
Socialism
Strike
Supply and Demand
Sweatshop System
Syndicalism
Tariff
Tax
Tenement
Trusts
Usury
Value
Wages
Wealth

ECONOMISTS

Ely, Richard T.
George, Henry
Hadley, Arthur T.
Laughlin, James L.
Proudhon, Pierre J.
Smith, Adam
Walker, Francis A.
Wright, Carroll D.

Park entrance, Guayaquil

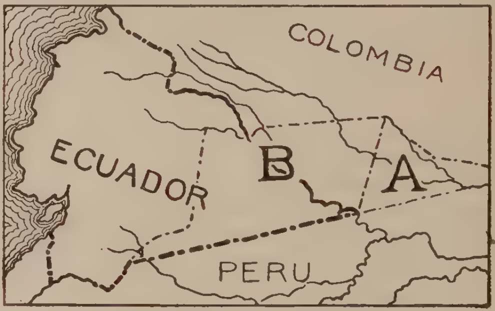
ECUADOR, *ek′wah dawr,* next to the smallest republic of South America, exceeding only Uruguay in size. In shape it is triangular, with the base on the Pacific Ocean; it extends to a point about 500 miles eastward, but the actual boundary is in dispute. Peru claims a considerable portion of Ecuador and a little of Colombia, while Ecuador claims not only all of its present area but a triangular section of Northeastern Peru (see map). The undisputed area is 116,000 square miles, and the country is therefore slightly larger than Arizona. The population in 1919 was estimated at 2,150,000. Quito, the capital (70,000 people), is the most elevated seat of government in the world, and is only a few miles south of the equator.

The People. Nearly three-fourths of the population are Indians and mixed descendants of the Incas (which see); about 400,000 of these are of mixed blood. There are only a few thousand people of pure European stock. The Indian population is fairly industrious and orderly, a heritage from generations of well-behaved ancestors, but their condition is almost one of bondage. Spanish is the official language (see DEMARCATION, LINE OF), but the Indians use a number of dialects. The religion is Roman Catholic. Education is in a backward state; there are fewer than 75,000 children in schools. There is a university in Quito, and in the whole country there are a few secondary schools.

Surface and Drainage. The surface of Ecuador is divided into three regions: the lowland region along the coast; the highlands, including the mountains and plateaus in the central portion of the country, and the extensive plains on the east. The coast region is comparatively narrow, and from this the highlands rise abruptly to the plateau, upon which two parallel ranges of the Andes rest, extending north and south. Among the groups of mountains of this region are sixteen peaks having altitudes ranging from 15,000 to 20,500 feet. The most noted of these are Chimborazo, 20,498 feet, and Cotopaxi, 19,600 feet, as far as known the highest active volcano in the world. Near the northern boundary these parallel ranges converge and form several elevated tracts, known as *knots*, the most prominent one being in the southern part of Colombia. Toward the south there is a similar convergence, and between these points are a number of plateau valleys, the most important being those of Quito, Hambato and Cuenca. In elevation these range from 8,000 to 14,000 feet. Their soil is fertile, and they are the home of the greater part of the population of the country. East of the Andes the land slopes to the great plain, which is continuous with the basin of the Amazon.

Most of the rivers are rapid mountain streams and are of little value for navigation. However, the Amazon, known in this part of its course as the Maranon, is navigable to the point nearest to the southern boundary, and some of the larger tributaries can be ascended a part of the way with small boats.

Climate. Being directly under the equator, Ecuador has a tropical climate, but owing to the varying elevations, this is greatly modified, so that actually within the country all grades of climate, from the tropical to the frigid, are found. The lowlands on the coast are exceedingly hot, moist and in many localities unhealthful; and the plains on the east are hot and comparatively dry, while the plateau valleys have a temperate and salubrious climate, in which spring reigns throughout the year. Above these, the highest altitude of the mountains have a rigorous, cold climate, and most of the summits are crowned with perpetual snow. The rainfall is ample for agricultural purposes, and throughout the county there are two seasons, known as the wet and the dry, though in the plateau valleys these are not distinctly marked.



THE BOUNDARY DISPUTE
A. Ecuador's claim; B. Peru's claim.

Mineral Resources. Ecuador has rich deposits of minerals, consisting of gold-bearing quartz, silver ore, deposits of copper, iron, mercury and petroleum. Emeralds and other precious stones have also been found within the country. However, owing to lack of transportation facilities and the indisposition of the people to engage in mining none of these has been worked on an extensive scale. British companies are working the oil fields.

Industries. Agriculture is the leading industry and is carried on chiefly in the plateau valleys. Wheat and barley sufficient for home needs are raised, and in some districts corn is successfully cultivated. Cattle are raised on the plains, and on the west side of the mountains there are many large tracts devoted to the cultivation of the cacao tree. Coffee is also raised upon the lowlands. Cacao is the country's staple product; cinchona bark, sarsaparilla, india rubber, hides and sugar are other agricultural and forest exports. Manufactures are few, and are confined almost entirely to domestic industries, except the manufacture of Panama hats, the world's center of this industry. This work is done almost entirely by the Indians.

Transportation facilities are very poor. The only carriage road is from Quito to Guayaquil, which has a length of about 125 miles, but a new road was begun in 1918 from Guayaquil to extend twenty miles up the Daule River. There is also a line of railway connecting Curan, opposite Guayaquil, with Guamote, 125 miles distant. The country contains about 4,400 miles of telegraph lines. Throughout the interior all goods are carried upon pack animals, and lack of transportation facilities prevents extensive commerce with foreign countries. In the rainy season there is river transportation. Most of the foreign trade is with France and Great Britain, but the United States is securing a foothold since the opening of the Panama Canal.

Government. The government is republican in form. The chief executive is a President, who is elected by direct vote for four years. The legislative power is vested in a Senate of thirty-two members, and a Chamber of Deputies of forty-eight members. The senators are apportioned two to each province and are elected by direct vote for a term of four years, while the members of the lower house are elected for a term of two years. The local government of each province is administered by a governor and a council.

History. Ecuador was a part of the empire of the Incas, and the country still contains remains of roads and other public works constructed by these people before they were conquered by the Spaniards. For some time after the conquest it was under the government of the viceroy of Peru. In 1822, along with other Spanish colonies, Ecuador gained its independence and became a part of the Republic of New Granada, now Colombia. This union was dissolved in 1829, since which date Ecuador has been an independent state.

Ecuador's future lies largely in the hands of Americans and Britons, who are taking an intelligent interest in the development of the country's resources. The sympathy of the country with the entente allies in the World War was expressed in 1917, soon after the United States entered the conflict, by severance of diplomatic relations with the German government. In 1917 a serious boundary dispute with Colombia was settled peacefully by treaty.

Related Articles. Consult the following titles for additional information:

Andes
Chimborazo
Cotopaxi
Galapagos
Guayaquil
Quito

ECZEMA, *ek'ze ma,* a common skin disease, characterized by severe itching and the formation of crusts and scales. It may be caused by constipation, gout, indigestion or a disordered nervous system, and in many cases it is cured by a change of habits. Those afflicted should be cautious about using advertised remedies, salves, ointments, etc. The safest mode of procedure is to consult a reliable physician and follow his directions.

Babies are prone to three forms of eczema. Thin, undernourished infants sometimes have a dry, scaly eczema, principally upon the chest. Proper attention to the child's diet is the remedy in this case. Eczema of the face and head in fat babies is generally caused by too much fat in the food; the remedy is a change of diet, with increase of starch and sugar and decrease of fat. The third kind of baby eczema is called tetter, or milk eczema. The child's cheeks appear red and chapped, and there may be scaly patches on the head. Such a child should be examined and have a diet prescribed for him.

ED'DA, the name given to two ancient writings in Scandinavian literature, known respectively as the *Elder,* or *Poetical Edda,* and the *Younger,* or *Prose Edda.* The first of these was compiled probably some time between the tenth and the thirteenth century. It consists of a collection of thirty-three songs which treat of the Scandinavian gods and heroes. The *Younger Edda* presents a kind of synopsis of the Northern mythology, and contains a treatise on the poetry and versification of the skalds, or ancient poets. It was first published in the seventeenth century, but it is supposed to have been written in the thirteenth.

ED'DY, CLARENCE (1851–), an American organist and composer, born at Greenfield, Mass., and educated in America and in Germany. He was for twenty years a church organist in Chicago, and in the course of that time, and later, gained and maintained celebrity through his performances at international expositions and recitals in the great world centers of music. He has been called the greatest organist in America. Abroad he has received full recognition of his genius as an artist and as a composer.

EDDY, MARY BAKER (1821–1910), the discoverer and founder of Christian Science, born at Bow, N. H., July 16, 1821. She received her early education from her brother, Albert Baker, and at a private school in Tilton, N. H. Always thoughtful and religious, she early united with the Congregational Church, of which she remained a member until after her discovery of Christian Science. Of this discovery, which came to pass when she was living in Lynn, Mass., she wrote: "During twenty years prior to my discovery I had been trying to trace all physical effects to a mental cause; and in the latter part of 1866 I gained the scientific certainty that all causation is Mind and every effect a mental phenomenon." She then laid plans to spread her doctrines.

In 1875 Mrs. Eddy published *Science and Health with Key to the Scriptures,* the Christian Science text-book, which has been through many editions and has been translated into many foreign languages. Among her works written later are *Miscellaneous Writings, Unity of Good, The Church Manual, Retrospection and Introspection, Rudimental Divine Science,* and *Pulpit and Press.* In 1879 she organized the Church of Christ, Scientist, which in 1892 was reorganized as the First Church of Christ, Scientist, in Boston, Mass. In 1881 she opened the Massachusetts Metaphysical College, the only institution of this kind having a charter from the state. Mrs. Eddy founded the periodicals of the denomination now issued by the Christian Science Publishing Society from its building in Boston, including the *Christian Science Journal,* a monthly; *Der Herold der Christian Science,* a German monthly; the *Christian Science Sentinel,* a weekly; and the *Christian Science Monitor,* an international daily.

When a young woman, Mrs. Eddy was married to George Washington Glover and removed with him to Charleston, South Carolina, where he died. In 1877 she married Dr. Asa G. Eddy, who was associated with her in the work of Christian Science.

For a number of years, Mrs. Eddy lived in comparative retirement at Concord, N. H. In 1908 she went to Chestnut Hill, a suburb of Boston, where she remained until her death in 1910, loved and revered by a vast multitude of people. Unlike many reformers, Mrs. Eddy was privileged to see the fruition of her work in the wide acceptance of her teachings. Before her death she was recognized as one of the world's great religious leaders. See CHRISTIAN SCIENCE.

E'DEN, in Biblical literature, the country where man first resided, specifically, the home of Adam and Eve. Much has been written upon the probable locality of Eden, but writers fail to agree in establishing its boundaries, though nearly all concur in locating it somewhere near the head of the Persian Gulf, probably in the valley of the Euphrates, as this country conforms more closely than any other part of the world to the description given in *Genesis.*

EDENTATA, *e den ta'tah,* a group of animals that have no front cutting teeth and therefore feed on insects and decaying animal matter. The pangolins and ant-eaters have no teeth at all; the armadillo, sloth, and aard-vark have rudimentary teeth in the back of the jaws. The edentata rank as the lowest of mammals, because the brain is small and undeveloped. The animals are slow in their movements, owing to the peculiar structure of their legs, which terminate in hooflike claws. The bodies are covered with coarse hair, which in the case of the pangolin forms a protective armor. Some of the edentata are found in Africa and Southern Asia, but the largest numbers and species inhabit South America.

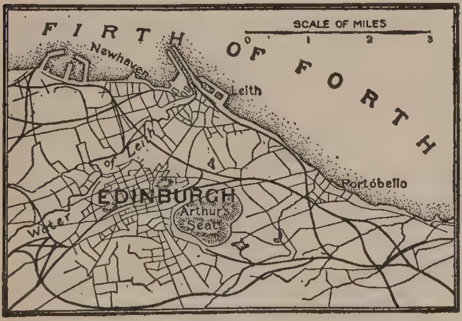
Related Articles. Consult the following titles for additional information:

Aard-vark
Ant-eater
Armadillo
Sloth

ED'GAR ATH'ELING, (about 1057–about 1120), grandson of Edmund Ironside. After the Battle of Hastings, Edgar was named king of England by the Saxons, but William the Conqueror retained the power. Having been engaged in some conspiracy against the king, Edgar was forced to seek refuge in Scotland, but he became reconciled to William and was assigned a pension. Afterward, with the sanction of William Rufus, he undertook an expedition to Scotland for the purpose of displacing the usurper of the Scottish throne in favor of his nephew Edgar.

EDICT OF NANTES. See NANTES, EDICT OF.

EDINBURGH, *ed'n bur o,* SCOTLAND, capital of the country, a city of great historic interest. In Edinburgh Mary Queen of Scots and John Knox passed many eventful days, and it was at various times the home of Scott, Burns, Carlyle, De Quincey and Stevenson. The city is picturesquely situated on three elevations, and is surrounded on all sides by lofty hills, except on the north, where the ground slopes gently toward the Firth of Forth. It is divided into an Old Town and a New Town, and between these runs Prince's Street, one of the finest promenades in the world. Through the Old Town runs Canongate Street, rising gradually for almost a mile, and parallel with this is Cowgate Street. On the east, Calton Hill, 349 feet high, overlooks the city. Nearby are Salisbury Crags, and directly behind this a rocky hill, Arthur's Seat, 796 feet high.



Among the notable buildings are the ancient Parliament House, now the seat of the Supreme Court of Scotland; Saint Giles Church, or Cathedral, an imposing edifice in the later Gothic style, recently carefully restored; the Tron Church; Victoria Hall, with a fine spire, and the Bank of Scotland, besides some of the old family houses of the Scottish nobility. Sir Walter Scott's monument is in the New Town. In the Old Town the most remarkable public building is the Castle. In an apartment there are kept the ancient regalia of Scotland. About a mile northeast of the castle is the celebrated royal Palace of Holyrood, which had its origin in the abbey founded by David I in the twelfth century. No part of the present Palace is older than the time of James V (1528). In the northwest angle of the building are the apartments which were occupied by Queen Mary, nearly in the same state in which they were left by that unfortunate princess.

Among the various educational institutions are the University of Edinburgh, one of the most famous in Europe; the Advocates' Library, the largest library in Scotland, containing upward of 250,000 printed volumes and 2,000 manuscripts, and a fine public library erected by Andrew Carnegie. Besides the buildings already noted, Edinburgh possesses a large number of important edifices and institutions, chief among which are the Royal Institution, the National Gallery of Scotland, the Museum of Science and Art, the new Episcopal Cathedral of Saint Mary's and the Edinburgh Royal Infirmary, one of the best hospitals in Europe. This city is the headquarters of the book trade in Scotland and is the seat of the chief government departments.

Edinburgh is not an important manufacturing town; it has, however, various industries, including brewing, printing and publishing. The port is Leith.

In civic matters Edinburgh is very progressive. The city owns its street car, gas, street lighting and water supply systems, has built model tenements for its working people and has established public markets.

The origin of Edinburgh is uncertain. Its name is thought to be derived from Eadwinsburgh, the Burgh of Edwin, a powerful Northumbrian king, who absorbed the Lothians in his rule. The town was made a royal burgh in the time of David I; but it was not till the fifteenth century that it became the recognized capital of Scotland, under the Stuart kings. Population, 1911, 320,315; in 1921, 420,281.

EDINBURGH, University of, a university established at Edinburgh, Scotland, in 1582, by a charter granted by James VI. The government is vested in a senate, the university court and a general council. The general council consists of the chancellor, members of the university court, the professors and all graduates of the university. Degrees are given in music, science, arts, divinity, law and medicine. The medical department has attained a world-wide reputation for its efficiency. In normal years the faculty numbers 200 and there are about 2,000 students enrolled. The library contains 220,000 volumes and many manuscripts. In addition to this, there is a theological library of about 10,000 volumes. Women are admitted to university privileges.

EDISON, Thomas Alva (1847–), the most notable inventor of modern times, aptly called the "wizard of electricity." He was born at Milan, Ohio, received a common school education, and when still a mere lad began work as a newsboy on the Grand Trunk Railway. He learned printing in spare moments and edited and printed the *Grand Trunk Herald* in the baggage car of the train on which he was employed. A course in telegraphy was given him in recognition of his having saved a child's life, and he became a very rapid and skilful operator. He was employed by the Western Union Telegraph Company and in this capacity began the series of inventions which brought him fame.

After brief sojourns in several western cities he settled in Boston. Carrying on his experiments there, he was able to overcome the difficulties connected with sending two messages in opposite directions at the same time over the same wire. In 1868 Edison happened to be in New York when the indicator at the Gold and Stock Exchange broke down. He volunteered his services and succeeded in adjusting the instrument.

His laboratories were first located at Menlo Park, N. J., and later he established headquarters at Orange, N. J., where he afterward lived. He has devoted himself mainly to electricity, but has had marked success in other lines. He has taken out at least 2,500 patents. Some of his most valuable inventions, patented in other countries as well as in America, are the phonograph, an instrument for making permanent records of articulate sounds; the microphone, which detects the faintest sound; the megaphone, by the aid of which ordinary sounds can be heard at a great distance; the microtasmeter, which records minute variations in temperature. His incandescent lamp combines purity, steadiness, safety and simplicity and is the most widely used of all of his inventions. The kinetoscope, which is one of his latest inventions, is a machine for projecting motion pictures. Although he has never made a great scientific discovery, Edison has done an inestimable service to mankind in applying scientific knowledge to practical ends. His influence on the industries and commerce of America cannot be overestimated.

ED'MONTON, Alberta, the capital of the province, 800 miles northwest of Winnipeg and 525 miles east of Vancouver. It is situated on the Canadian Northern, the Canadian Pacific and the Grand Trunk Pacific railroads, which have also numerous branch lines radiating from the city, and on the north branch of the Saskatchewan River. Edmonton is one of the most important cities of Western Canada. Of the towns in the prairie provinces only Calgary, 192 miles south, was larger in 1916. In 1901 there were only 2,626 people in the city; ten years later the number had increased to 24,900, and in 1921, by census, 58,821.

The industries of the city include meat-packing establishments, foundries, saw mills, flour mills, brickyards, grain elevators, cigar-making, motor-boat yards, as well as a great variety of lesser factories. There are twenty banks and over ninety wholesale houses. Educational facilities are unexcelled; the University of Alberta is here, and the city also has Robertson College, Roman Catholic convents and a seminary. The churches number more than forty. The finest buildings are those of the provincial parliament and of the university.

Edmonton is the center of a vast timber region; there is natural gas in the vicinity, and strong indications of oil are not lacking. There are thirty coal mines in or near the city. The municipality owns the public utilities—electric light, waterworks, telephones and the street railways.

Edmonton was the site of a trading post as early as 1795; a few years later it became one of the outposts of the Hudson's Bay

THOMAS A. EDISON

"I know no genius but hard work." If every man could become as absorbed in his work, as is the habit of Edison—it is said that Edison, busy on an invention, forgot to go to his wedding—there would be no failures.

Company. In 1876 the first telegraph line reached the town; in 1891 the first railroad was built north from Calgary. In 1905 the city became the capital of the new province of Alberta.

EDOM (in the New Testament, IDUMAEA), in ancient times a country lying to the south of Palestine, between the Dead Sea and the Gulf of Akabah. The chief city in this region was Bozrah, the site of which is now remarkable for its ruins.

EDUCATION, *ed u ka′shun.* Someone has said that *education* is the largest word in the vocabulary of life, because it symbolizes all the forces that have raised man from the plane of the brute. The derivation of the word confirms the above statement. It is from the Latin *educere,* which means *to lead forth,* and in its broadest sense it signifies the bringing out and developing of all the powers of the individual.

There are two sorts of education, that obtained from the schools and that obtained from the experiences of life. All men obtain the latter, but only those living in countries having systems of public schools are likely to obtain the former. Since a person with a well-trained mind can make a much wider application of his experiences than one who does not possess this training, it follows that of all the forces that work for man's education the school has the most direct and the most widespread influence. Were it not for the organized school systems of the various nations, the majority of the people in the world to-day would be unable to read or write. Generally speaking, a nation that is progressive and enlightened has a small percentage of illiteracy. It has been a backward, despotic country, like the Russia of centuries under the czars and recently under the terror of bolshevik outrage, and China under the emperors, which kept the great mass of the people ignorant and unenlightened.

The tendency everywhere is more and more toward the extension of popular education. In 1918, England, though in the throes of the World War, passed a new education bill, making its national school system more democratic. The same year saw a bill discussed in the United States Congress providing for appropriations to the Bureau of Education whereby the Bureau could carry on intensive work with the various states and utterly stamp out illiteracy in the country.

The sponsors of movements such as these recognize the great handicap suffered by the individual with limited school advantages. In normal times a boy with an elementary school education can hope to obtain a position that will pay him two dollars a day. Those who have attended high school will work up to positions averaging $100 a month. The college-trained man may be earning many times that amount, for his mental equipment is far superior. The practical value of an education, however, is not its only favorable aspect. A liberal education opens many new fields in general culture, and it gives the individual a greater capacity to enjoy the worth-while things of life.

As stated above, education in a broad sense is the development of all the powers of the individual. This fact is recognized in modern school systems in their provision for physical as well as intellectual training. In many towns and cities, doctors, dentists and nurses examine the pupils of the schools for physical defects, and those with bad teeth, adenoids, diseased tonsils, defective eyesight and hearing, Saint Vitus's dance and other ailments are placed under proper medical care. In the poorer districts of some large cities the children are given nourishing food free or at a nominal cost, and school lunchrooms and cafeterias, which serve well-cooked and wholesome foods, are becoming common. Playgrounds and gymnasiums are also included in the equipment of the most up-to-date schools, and swimming pools are added to this equipment in many modern high schools.

Another modern tendency is the emphasis placed on the practical, and the inclusion in the curriculum of manual training, cooking, sewing and other "useful" subjects. Vocational schools and evening classes, open-air schools, schools for the deaf, dumb and blind, professional schools and schools for training teachers flourish, and emphasize the fact that modern education is not only broad but so specialized that there is a place for everyone in the road to knowledge.

For national systems of education, see articles on the various countries.

Related Articles. Consult the following titles for additional information:

GENERAL

Abacus
Academy
Adolescence
Agricultural College
Agricultural Experiment Stations
Alma Mater
Blindness, subhead Education of the Blind
Business College
Child Study
Child Training
Coeducation
College
Common Schools
Compulsory Education
Conservatory
Corporal Punishment
Correlation
Deaf and Dumb
Deductive Method
Degree
Education, Bureau of; Commissioner of
Education Association, National
Elective Studies
Feeble-minded, Education of
Fellowship
Fraternities, College
Games and Plays
Gardening
Geography, Methods of Teaching
Gymnasium
High School
History, Methods of Teaching
Illiteracy
Indians, American, subhead Indian Education
Inductive Method
Industrial School
Kindergarten
Language, Methods of Teaching
Law Schools
Library
Lyceum
Medical Schools
Methods of Teaching
Military Schools
Montessori Method
Negro
Normal School
Number, Methods of Teaching
Open Air Schools
Parent-Teacher Associations
Peabody Educational Fund
Pedagogics
Rhodes Scholarships
School Gardens
Schools, Consolidated
Schools, Correspondence
Sloyd
Story Telling
Technical and Industrial Education
University
University Extension
Vocational Guidance

SUBJECTS TAUGHT IN SCHOOLS

Agriculture
Algebra
Anatomy
Archaeology
Arithmetic
Astronomy
Biography
Biology
Botany
Calculus
Chemistry
Civil Government
Drawing
Economics
Geography
Geology
Geometry
Grammar
History
Language and Grammar
Literature
Manual Training
Mathematics
Mineralogy
Mythology
Nature Study
Orthography
Philology
Philosophy
Phonetics
Physical Culture
Physics
Physiology
Psychology
Reading
Rhetoric
Sanitary Science
Shorthand
Sociology
Spelling
Trigonometry
Writing
Zoölogy

EDUCATIONAL INSTITUTIONS

All state and provincial universities are listed under their appropriate headings.

For other educational institutions consult the following titles:

Amherst College
Armour Institute of Technology
Barnard College
Berlin, University of
Boston University
Bowdoin College
Bryn Mawr College
Cambridge, University of
Carnegie Foundation
Carnegie Institution
Catholic University of America
Chautauqua Institution
Chicago, University of
Cincinnati, University of
Clark University
Columbia University
Cornell University
Dartmouth College
Denver, University of
De Pauw University
Drexel Institute
Edinburgh, University of
Eton College
Fisk University
George Washington University
Girard College
Hampton Normal and Agricultural Institute
Harvard University
Johns Hopkins University
Laval University
Leland Stanford Junior University
Lick Observatory
McGill College and University
Massachusetts Institute of Technology
New York, College of the City of
New York University
Northwestern University
Notre Dame, University of
Oberlin College
Oxford University
Paris, University of
Pennsylvania, University of
Princeton University
Purdue University
Radcliffe College
Rugby School
Smith College
Syracuse University
Toronto, University of
Tufts College
Tulane, University of Louisiana
Tuskegee Normal and Industrial Institute
Valparaiso, University of
Vanderbilt University
Vassar College
Washington University
Wellesley College
Western Reserve University
William and Mary College
Williams College
Yale University
Yerkes Observatory

EDUCATORS

Angell, James Burrill
Armstrong, Samuel Chapman
Arnold, Thomas
Barnard, Frederick A. P.
Barnard, Henry
Brown, Elmer Ellsworth
Bryce, George
Butler, Nicholas Murray
Carman, Albert
Claxton, Philander P.
Comenius, John Amos
Dawson, John William, Sir
De Mille, James
Dewey, John
Draper, Andrew Sloan
Duncan, Norman
Eliot, Charles William
Fenelon, François de Salignac
Finley, John H.
Froebel, Friedrich Wilhelm August
Garfield, Harry Augustus
Gilman, Daniel Coit
Hadley, Arthur Twining
Hall, G. Stanley
Harper, William Rainey
Harris, William Torrey
Hibben, John G.
Hopkins, Mark
Hughes, James Laughlin
James, Edmund Janes
Jordan, David Starr
Judson, Harry Pratt
Low, Seth
Lowell, Abbott Lawrence
Lowell, James Russell
Mann, Horace
Mather, Increase
Montessori, Maria
Northrop, Cyrus
Norton, Charles Eliot
Parker, Francis Wayland
Pestalozzi, Johann Heinrich
Schurman, Jacob Gould
Sturm, John
Tyler, Moses Coit
Van Hise, Charles Richard
Vincent, George Edgar
Washington, Booker T.
Wheeler, Benjamin Ide
White, Andrew Dickson
Willard, Emma Hart
Wilson, Woodrow
Young, Ella Flagg

EDUCATION, BUSINESS. See BUSINESS COLLEGE.

EDUCATION, BUREAU OF. The United States Bureau of Education was established in 1867 as a division of the Department of the Interior. Its function is to gather and distribute information on education, but its work is of an advisory nature, and its officials are careful not to interfere with the systems organized by the various states. Among the divisions of the Bureau are those on rural education, school sanitation and hygiene, home education and school administration. Circulars and bulletins, which may be obtained on request, are published from time to time.

Commissioner of Education, the title of the officer at the head of the Bureau of Education. The office was established in 1867, and Henry Barnard (see BARNARD, HENRY), was appointed first Commissioner. The appointment is by the President with the consent of the Senate. The chief duty of the Commissioner is to collect educational statistics and give such information relative to the inspection, organization and management of public schools and methods of educating as will be of assistance in improving education throughout the country. The Commissioner publishes biennial reports, which embody his recommendations, and contain much valuable information concerning the educational systems and methods of teaching, not only in the United States but in other countries. The present Commissioner is John J. Tigert, appointed in 1921.

EDUCATION, COMPULSORY. See COMPULSORY EDUCATION.

EDUCATION, NATIONAL SYSTEMS OF. See the subhead *Education,* in the articles on the various countries.

EDUCATION ASSOCIATION, NATIONAL, an association organized at Philadelphia in 1857 at the National Teachers' Association, incorporated in 1886 in the District of Columbia under its present title. For the first few years the National Education Association did not gain strength, but about 1870, through the division of the association into specialized departments and through the absorption of the American Normal Association and the National Superintendents' Association its effectiveness was greatly increased. There are now eighteen departments, besides an advisory board, known as the National Council, and the Department of Superintendents. The association holds annual meetings in different parts of the country, at which well-known educators lead in the discussion of all sorts of problems affecting the teacher's calling. The proceedings of the body are published as annual reports. Reports of committees upon special topics are also published under the auspices of the association. There are about 10,000 active members in the association and as many more associate members. The annual sessions are growing in importance. A fine building for national headquarters has been erected in Washington.

EDWARD, surnamed *the Confessor* (about 1004–1066), king of England, son of Ethelred II. On the death of his half-brother, Hardicanute the Dane, in 1041, he was called to the throne and thus renewed the Saxon line. He cared little for political matters and spent most of his time in holy works. In 1161 he was canonized.

EDWARD, THE BLACK PRINCE (1330–1376), the eldest son of Edward III of England. In 1346 he commanded part of the forces at the Battle of Crecy and distinguished himself. In 1355 he commanded the army which invaded France from Gascony and won a victory in the great Battle of Poitiers. By the Peace of Bretigny, several provinces of France were formed into a sovereignty for the prince, under the title Principality of Aquitaine. When he recaptured Limoges from the French (1370), Edward put to death about 3,000 of the inhabitants. This is the greatest stain on his history. After his return to England he opposed many of his father's oppressive measures.

EDWARD I (1239–1307), king of England, son of Henry III, whom he succeeded in 1272. Before his accession to the throne he put down several revolts in Wales, which had been entrusted to his government. He also took part in a crusade with Louis IX of France, but accomplished nothing of importance. After his accession, he again turned his arms against Wales and succeeded in annexing that country to England. During the greater part of his reign he was engaged in a struggle for Scotland. When chosen judge to examine the rival claims of John Baliol and Robert Bruce he gained a hold on the country. When in 1306 Robert Bruce was crowned at Scone, Edward started north to subdue Bruce, but died on the way.

Edward was a great king and did much for England by establishing order and restricting the power of the clergy. For his influence on the laws of this country he is known as "the English Justinian." The most important event of his reign was the placing in the hands of a Parliament, in which the people of England were to be represented, all power to levy taxes.

EDWARD II (1284–1327), king of England, son of Edward I, on whose death, in 1307, he came to the throne. His weakness and incompetency soon became apparent, and the fact that he was constantly under the dominion of foreign favorites led to numerous revolts. The war which his father had begun against the Scotch, Edward attempted to prosecute, but in 1314 he was completely defeated by Robert Bruce at Bannockburn, and some years later he was compelled to make a most unfavorable treaty with Scotland. He was at length deposed by a conspiracy of his great nobles and his wife, and in 1327 was murdered. His son succeeded him as Edward III.

EDWARD III (1312–1377), king of England, was made king on the murder of his father in 1327. The real power lay with the queen-mother Isabella and Mortimer, her lover, but three years after his coronation Edward banished Isabella from his court, had Mortimer put to death and took the power into his own hands. In 1333 he conducted an expedition against Scotland and won a victory at Halidon Hill, but in his other campaigns against Scotland he accomplished nothing of importance. French interference in favor of the Scotch gave Edward an excuse for invading France, of which he claimed, through his mother, to be the rightful sovereign. His victories there, even the capture and imprisonment of the French king, John, made England no richer; in fact, when Edward withdrew from the war that country was in an exhausted condition. The closing years of Edward's reign were disturbed by constant conflict with Parliament and by the opposition of his son, the Black Prince (see EDWARD, THE BLACK PRINCE).

EDWARD IV (about 1442–1483), king of England. His father, Richard, Duke of York, was the grandson of the fourth son of Edward III, while the rival line of Lancaster descended from John of Gaunt, the third son. Edward, on the defeat and death of his father at the Battle of Wakefield, became the head of the Yorkist party, and having entered London, after his splendid victory over the troops of Henry VI and Queen Margaret, was crowned with acclamation. His hold on the throne was not yet secure, however, and when the powerful Earl of Warwick, offended at Edward's marriage, went over to the Lancastrians, Edward was forced to leave the country. In 1471 he landed in England with an army, met Warwick and defeated him and was again proclaimed king. The remainder of his reign was peaceful.

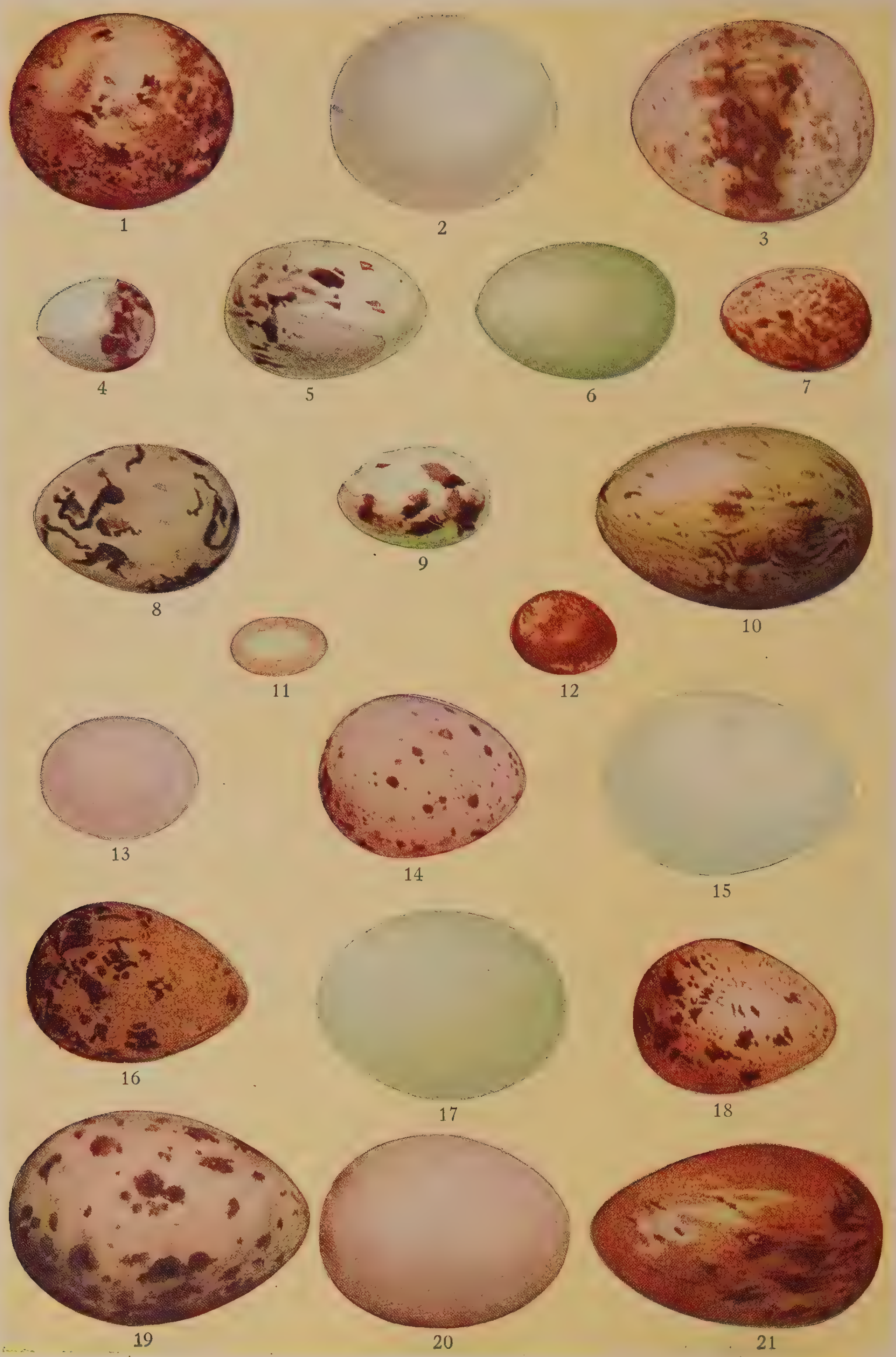
EDWARD V (1470–1483), king of England, son of Edward IV. Upon his accession, at the age of thirteen, his unscrupulous uncle, Richard, Duke of Gloucester, proclaimed himself Protector of the Kingdom. He denied the legitimacy of the king and his brother and sent them to the Tower of London and afterwards had them murdered. The Duke is known in history as Richard III.

EDWARD VI (1537–1553), king of England, son of Henry VIII by his third wife, Jane Seymour. On his accession to the throne, upon the death of his father, his first care was to strengthen and advance the religious reforms instituted during his father's reign. Edward was himself too young to have much influence in affairs, and the chief power during his reign lay, first with his uncle, Edward Seymour, and later with the Earl of Warwick.

EDWARD VII (1841–1910), king of the United Kingdom of Great Britain and Ireland and emperor of India, the eldest son of Queen Victoria and Prince Albert, was born at Buckingham Palace, November 9, 1841. He inherited the title of Prince of Wales and was christened Albert Edward. He was educated at Christ's Church College, Oxford, and Cambridge University. In 1860 he visited Canada and the United States, where he received a most cordial welcome. Two years later, in company with Dean Stanley, the young prince made an extensive journey through Egypt, Palestine and India. In 1863 he married Princess Alexandra, daughter of Christian IX of Denmark, by whom he had six children: Albert Victor, duke of Clarence, who died in 1892; George, duke of Cornwall and York, later George V; Louisa, duchess of Fife; Victoria, Maude and Alexander John, who died in 1871.

EDWARD VII

Although during the reign of Queen Victoria Edward had little or no part in state politics, he made frequent visits to the leading courts of Europe. He was a close student of world politics, and when he became king he astonished all but those intimately acquainted with him by his tact and



BIRDS' EGGS

Birds of Prey
1, Sparrow Hawk.
2, Screech Owl.
3, Sharp-Shinned Hawk.

Perchers
4, Wood Pewee.
5, Meadow Lark.
6, Yellow-Billed Cuckoo
7, Bobolink.
8, Purple Grackle.
9, Kingbird.
10, American Crow.
11, Humming Bird.
12, House Wren.

Climbers
13, Red-Headed. Woodpecker.

Scratchers
14, Gamble's Partridge.
15, Hen's Egg.

Waders
16, Spotted Sandpiper.
17, Green Heron.
18, Semipalmated Sandpiper.

Swimmers
19, Gull. 20, Duck. 21, Tern

sagacity in diplomatic affairs. His reign was characterized by the negotiation of treaties which placed Great Britain in friendly relations with the leading nations of the world. The most notable were the alliances with Japan, France and Italy, and the friendly understanding with Russia. These treaties not only changed the position of Great Britain from that of isolation, in which she took pride during Victoria's reign, to that of friendly coöperation with other nations; but they also exerted a strong influence in maintaining for a long time the peace of the world and determined the alignment of nations when in 1914 war could no longer be averted.

EDWARDS, Jonathan (1703–1758), an American theologian and philosopher, was born at East Windsor, Conn. At seventeen he was graduated from Yale College and already had begun his serious metaphysical speculations. In 1727 he was ordained, and began preaching in Northampton, Mass. His pulpit eloquence won him fame throughout New England, but his uncompromising attitude with respect to certain Church doctrine led to his dismissal. He obtained an appointment as a missionary among the Indians, and in the quiet and seclusion it offered him he wrote his greatest books, *Freedom of the Will, Nature of Virtue, Original Sin,* and *Dissertation Concerning the End for Which God Created the World.*

EEL, a long, slimy, usually scaleless, or almost scaleless fish. Eels are sluggish during the day, but become active by night, sometimes crawling considerable distance on land through damp grass. They are good food-fish, though some people are prejudiced against them because of their snakelike appearance. There are a number of species, of which the commonest are the fresh-water eels, living on both sides of the Atlantic, in fresh-water streams for most of the year, but going to the sea to lay and hatch their eggs. See Electric Fish.

EG'BERT, (?–839), considered the first king of all England, was of the royal family of Wessex. He became in 802 king of Wessex, and before 830 he had reduced the other kingdoms and rendered them dependent on him.

EGG. This term is usually thought of in connection with the eggs deposited by birds, from which the young are hatched, but zoölogists apply the term to the reproductive cell from which all animals proceed, except those that are reproduced by cell division. In mammals, the class to which the human race belongs, the egg remains in the body of the female a long time, and the young are in most cases brought forth alive, but the larger proportion of egg-laying animals —worms, mollusks, insects, fishes, birds and reptiles—deposit the eggs before the young are hatched.

The eggs of birds are the most perfect and of the most general interest. The shell is composed almost wholly of carbonate of lime and has for its purpose the protection of the parts which it encloses. Just within the shell is a thin, tough membrane, which forms the lining. Next to the lining, and surrounding the yolk, is the white, which is composed almost wholly of albumen. The yolk is also inclosed in a thin membrane and is spherical. It is composed of a variety of substances, some of which contain margarine and oleine; its color is usually yellow. The germinal vesicle, or germ spot, is found within the yolk, and in the eggs of fowls it can be easily distinguished by its pearly-white appearance. It is from this that the young bird or chick is developed by incubation, the yolk and white serving for food during the process. In the large end of the egg there is a space between the lining and shell that is filled with air. As the egg grows old this increases in size. It is supposed by some that the air in this space is used by the chick while it is pecking out of the shell.

The germ is developed by heat, which is supplied by the female's sitting on the nest. The eggs of fowls and most birds require a temperature of 104° F. for successful incubation. The period of incubation varies with the species. The eggs of the white-eyed vireo require only seven days in which to hatch, while those of the common fowl require three weeks, and those of the turkey and most water fowl require four weeks.

The number of eggs laid by different birds also varies with the species. Some birds lay only one during the year, and others, as the hen, lay a large number. The robin usually lays four, the swallow from four to six and the crow four, six or seven. In many instances the color and shape of the egg are closely associated with the habits of nesting. Birds which lay their eggs on the ground without constructing any nest, lay an egg which is rounded at one end and nearly comes to a point at the other. If blown by the wind these eggs roll round in a circle, while if they were oval, like those laid in deep nests, they could easily be blown away. (Compare in the color plate accompanying this article the eggs of the spotted sandpiper and the tern with those of the sparrowhawk and the crow.) Eggs laid on the ground, or in nests built on the ground, usually take the color of the pebbles or dead grass with which they are surrounded, while the bright colors belong to the eggs laid in well-constructed nests. Another peculiarity of the coloring is that the greatest variation is about the large end of the egg. (See in the color plate the eggs of the wood peewee, bobolink, purple grackle, meadowlark and other birds.)

The economic use of eggs is well known, and the eggs of the hen, the guinea fowl, turkey and domestic duck constitute an important item in the world's supply of food. In Labrador, the Orkney and Shetland islands and some other localities, the inhabitants collect the eggs of sea birds for food.

For suggestions on cooking eggs, see the article Domestic Science.

EGGLESTON, EDWARD (1837–1902), an American novelist and historian, born at Vevay, Indiana. His education included an acquaintance with Latin and Greek and an extensive knowledge of the French language and literature, all gained largely through his own efforts. When nineteen years old he became a Methodist circuit rider and preached for ten years. His literary career began in 1866, as editor of the *Little Corporal*, at Evanston, Ill. In 1870 he became literary editor of the *Independent*, in New York City, and some time later he gave up that position to become editor of *Hearth and Home*. From 1874 to 1879 he preached in Brooklyn, and from the latter date he devoted himself to literary work. The purpose of his novels was to do "something toward describing life in the back country districts of the Western states," and the scenes of his most popular novels were laid in southern Indiana. Among his novels are *The Hoosier Schoolmaster, The End of the World, The Circuit Rider, Roxy, The Hoosier School Boy* and *The Graysons*. He wrote a history of the United States, formerly widely used in schools.

EGGPLANT, a bushy vegetable belonging to the same family as the potato. Several varieties are cultivated. In some the fruit has a whitish peel and is the size of a hen's egg; in others it is a deep purple on the outside and attains a diameter of from six to eight inches. The latter kind is a favorite vegetable on American tables.

EGLANTINE, *eg'lan teen,* a wild rose sometimes called *sweetbriar*. Small dark-green leaves grow thick on its brown stems, and single pink blossoms with yellow centers give off a spicy odor. The thorns are stout and curving. The flowers shatter quickly, but the bright red or orange fruits which follow them—larger than most "rose" apples—last all winter and vie with bittersweet as interior decoration.

EGMONT, or **EGMOND**, LAMORAL, Count (1522–1568), a Flemish statesman and general, born in Hainaut. He succeeded to the family title and estates in 1541 and fought in the campaigns of Charles V in Algeria and against Francis I of France. He was rewarded with high honors and with responsible offices under the emperor. When Margaret of Parma became regent general of the Netherlands, Egmont joined William of Orange in opposing her Catholic policy. When rebellion finally broke out, however, Egmont for a time remained neutral and refused to follow the prince of Orange and other leaders into voluntary exile. Suddenly he was seized by royal officers, imprisoned at Ghent, condemned to death and executed with Count Hoorne in 1568 in the public square at Brussels. Egmont is the hero of one of Goethe's greatest tragedies.

EGOISM, a term derived from the Greek and Latin word *ego,* meaning *I,* and used in philosophy in two senses. In its earliest application, it meant the theory that nothing except one's own self can really be known. Modern and much more common usage applies it to any system in ethics which sets up the happiness of the individual himself as the justifiable end of his motives and acts. In this latter sense it is the opposite of *altruism* (which see). The two theories, however, overlap at many points, and cannot be classed as absolutely distinct ideas in philosophy.

EGRET, *a gret'* or *a'gret,* the name of a species of wood herons. The feathers on the rear part of the bird's back are long, reaching to the end of the tail, and even beyond at certain seasons. They are more beautiful than the feathers of the common heron. The

American egret is about thirty-seven inches long, has soft plumage, a smooth head and twelve trailing feathers. It is one of the most beautiful of the native birds. The egrets have been so much hunted for their white flowing plumes, which women wear for ornament, that they are rapidly being exterminated. Laws now prohibit the wearing of egrets.

EGRET

Colossal statue of Rameses II

EGYPT, *e'jipt,* a country of Northeastern Africa, a dreary desert waste in most parts, but wonderfully fertile in a narrow strip along both banks of the River Nile.

Egypt is called the "gift of the Nile," for without its yearly overflow, at which times it deposits rich alluvial soil on either hand, the country would all be as worthless as the Libyan and Arabian deserts, lying a short distance to the west and east of that providential stream. All of Egypt which is of real value to the world, therefore, is a narrow strip of fertile land in a vast rainless region. The fertile part contains only 12,025 square miles; the arid region covers an area of about 351,000 square miles. The entire area of the country, exclusive of the southern portion, now known as the Anglo-Egyptian Sudan, is slightly more than 363,000 square miles.

Egypt is peculiarly fascinating to the historian of to-day, for this land was the cradle of a civilization so old that its beginnings reach far beyond the knowledge of man. Who can estimate what long periods of human effort preceded the building of the Great Pyramid? Yet that massive structure has been standing for five thousand years, a perpetual challenge to the highest skill of modern engineers. Centuries before the erection of the pyramids Egypt was ruled by an orderly government, and its kings of that far-off period, so remote that its date can only be conjectured, were builders of great irrigation works, monuments and temples.

The People. The census of Egypt has never been accurately taken; the population in 1917 numbered about 12,569,000 within the cultivated and settled area of 12,025 square miles, or 1,045 people to the square mile. Nearly 10,500,000 are Egyptians of mixed Arabian and negro blood; 1,000,000 are Turks and Europeans. The peasants are known as *fellahs.* Of the white people, Italians are most numerous; British residents are next in number; Frenchmen are third. Nearly all the native inhabitants profess the Mohammedan religion.

Surface and Drainage. Historically and geographically Egypt is divided into two parts; Lower Egypt, extending from the Mediterranean to Cairo, and including what is known as the Delta region; and Upper Egypt, extending from Cairo to the southern boundary. The Delta region is nearly triangular in shape. Its greatest extent from east to west is about 150 miles, and from north to south, 120 miles. This consists entirely of land made by the silt deposited from the river; it is low and level, contains many branches of the river, as well as numerous canals, and is very fertile. Within this region the greater part of the population of the country lives. The habitable portion of Upper Egypt consists of the valley of the Nile, which varies in width from fifteen miles, north of Cairo, to about two miles, farther up the stream. To the east of the Nile is a hilly and mountainous country, known as the Arabian Desert, but it should not be confounded with the desert of the same name in Asia. This region rises gradually by successive elevations until the highest altitudes are found on the borders of the Red Sea and attain about 7,000 feet, though the average altitude is much less than this. The surface is characterized by sand and barren rocks, and nearly all of the region is devoid of vegetation, except in a few places where there is sufficient moisture to afford scanty support for the flocks of the Bedouins. To the west of the Nile is the great Libyan Desert, a sandy plain which is nearly level, but has in a few places depressed areas, whose surface is below the level of the sea. Most of these depressions are watered from subterranean sources or by canals leading to them from the Nile, and they constitute the oases of the desert; some of them are very fertile, and all are under the government of Egypt.

Climate. Egypt is a land of clear skies and dry atmosphere. On the Mediterranean coast about 8 inches of rain falls during the year, while at Cairo the rainfall never exceeds 1½ inches, but at the extreme south there is a considerable rainfall. Less than one-fifth of the days are cloudy. Lower Egypt has a more even temperature than the desert region, removed from the influence of the sea. At Alexandria the temperature seldom reaches freezing point, but in the hot season, during the period of khamsin, it may reach as high as 110° or 115°. During the fall and winter the prevailing winds are from the north and northwest, while in the spring and summer they are from the south. April and May are characterized by the khamsin, which produces a high temperature and fills the air with sand (see KHAMSIN). The inhabitants divide the year into three seasons: the period extending from November to March; the summer, from March to June, and the period of overflow of the Nile, from July to November.

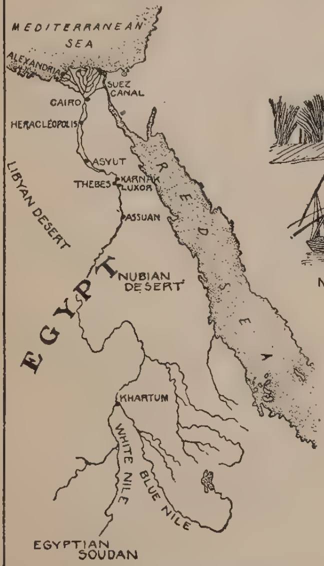
Mineral Resources. The most important minerals are building stone, consisting of granite, porphyry, limestone and sandstone. Of these the granite found near Syene, from which it was named syenite, is the most durable and has been known for the longest time. It was from these quarries that most of the rock for the great pyramids and for many of the ancient temples was obtained. The other stones are also valuable building stones and are now used to a considerable extent. Because of the drifting sands, many deposits of minerals are undoubtedly covered. Engineers who have examined the country report that possibly gold mining can be made profitable along the beds of certain dry streams and in other localities, though there has been no attempt at working the deposits.

Industries. Agriculture is the chief industry of the country and affords employment to more than two-thirds of the people who have a fixed occupation. The most important food plants are the date palm, wheat, rice, millet, vegetables and sugar cane. Besides these, various tropical and semi-tropical fruits are raised. Agriculture depends entirely upon irrigation and can be practiced only where water is obtainable. Because of this, the valley of the Nile is the only habitable portion of the country. The Delta region is provided with irrigation throughout the year, and here three crops can be grown. Of these, wheat and other cereals are raised between November and May; cotton and sugar cane mature between March and November, and maize and vegetables during a number of months of the year. The soil is exceedingly fertile, and notwithstanding the primitive methods of cultivation, excellent crops are obtained. Under English direction the rich soil yields nearly a bale of cotton on each acre, whereas in the United States nearly three acres are required to grow one bale. Since the construction of the barrage across the Nile at Cairo to raise the water in the river, a much larger area of the lower land is subject to irrigation, while the construction of the great dam at Assuan regulates the supply of water for the year. Most of the land is rented by those who work it.

Manufactures. There are few factories in the country. A number of sugar refineries are prospering, and a few cotton mills exist. Although Egypt is famous for the enormous quantities of cigarettes it manufactures, there is no tobacco grown in the country. There is much land suitable to the growth of a poor quality of the "weed," but its cultivation is prohibited, that there may be large revenue from its importation and to provide against the use of inferior tobacco in the factories. There is considerable textile manufacturing, largely of goods to be sold to tourists.

Transportation. The Nile is navigable for small steamers as far as the first cataract, which is just north of the southern boundary. The country contains 1,600 miles of railway, which is owned and operated by the government, and about 800 miles of so-called agricultural roads, operated by private corporations. These roads connect the agricultural regions with the main lines of railway and provide transportation for the produce of the country. The northern division of the

EGYPT

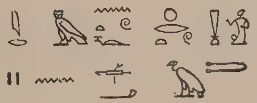


MODERN EGYPTIAN VILLAGE

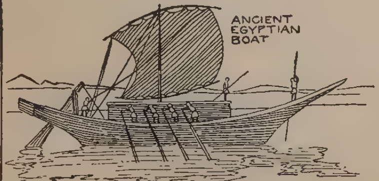
THE GREAT HALL OF COLUMNS AT KARNAK

SPHINX AT GIZEH

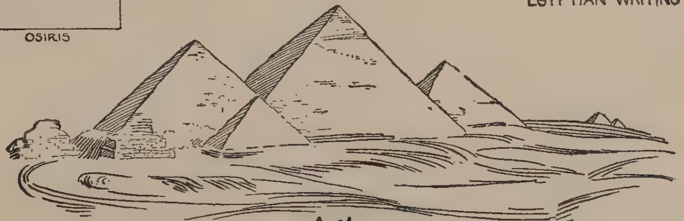
OSIRIS



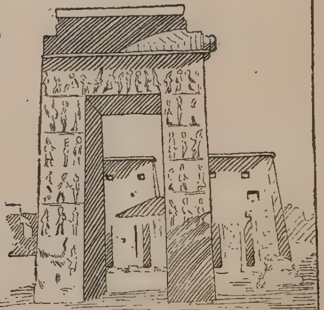
EGYPTIAN WRITING



ANCIENT EGYPTIAN BOAT



THE GREAT PYRAMIDS



GATEWAY AT KARNAK

·H·M·HAINES·

Cape-to-Cairo Railroad passes through Egypt. The Suez Canal receives none of Egypt's products except at its terminals. Telegraph communication between the principal cities and with other countries is complete, there being about 19,000 miles of wire; and a fairly good postal system is maintained. The commerce of the country is comparatively small and is confined to the necessities of the population. The imports consist of manufactured goods, particularly textiles, some food products and machinery, while the exports consist of cigars, cotton and sugar. Egyptian cotton is of the long staple variety and finds a ready market at high prices in England and other cotton manufacturing countries.

Government. Until 1914 Egypt was theoretically under Turkish ownership, though actually controlled in important affairs by Great Britain, whose interests there were paramount since the construction of the Suez Canal, constituting the country practically a British dependency. The nominal ruler was called the *khedive,* and he was appointed by the Turkish sultan.

In December, 1914, allied interests in the World War decided that Turkey's influence in Egypt should be nullified, for the Turks had been delegated by their German allies to capture or destroy the Suez Canal. In the month named the British Foreign Office issued the following statement:

> In view of the state of war arising out of the action of Turkey, Egypt is placed under the protection of His Britannic Majesty, and will henceforth constitute a British protectorate. The suzerainty of Turkey is thus terminated. His Majesty's government will adopt all the measures necessary for the defense of Egypt and the protection of its inhabitants and interests.

The khedive was deposed, and the British conferred the title of sultan upon Abbas Himla, eldest son of a former reigning family. Upon his death Ahmed Fuad Pasha (born 1868) became sultan as Fuad I, in 1917. The British protectorate was recognized by all the European allies of Great Britain in the war. In 1920 the country was given practical independence; Eqypt agreed to recognize Britain's position on the Nile, to permit British garrisons to control the Suez Canal and not to make treaties contrary to British interests.

History. The Egyptians are the earliest people known to us as a nation. By the beginning of the fifth century B. C., they were living under a settled government; they had built cities, invented hieroglyphic signs and improved them almost into an alphabet. The arrangement of the Egyptian chronology is still a much disputed point among scholars. A list of the kings, arranged in thirty dynasties, was made by the priest Manetho in the third century B. C., and this division is still used. The fourth dynasty, distinguished as the "Pyramid Dynasty," was the most important in early Egyptian history. It was at its height about 2700 or 2800 B. C. and left as its monuments the greatest of the pyramids. The twelfth dynasty, which seems to have begun about 2000 B. C., exercised a just and able rule over a prosperous country. Literature especially flourished during this period. About 1700 B. C., Egypt was conquered by a people whose rulers were called the Hyksos, or Shepherd Kings. Nothing is known of these people, except that they had first conquered western Arabia and Syria. The Theban princes seem to have preserved a state of semi-independence under the Hyksos rulers and at last a revolt arose which ended by the Shepherd kings being driven out of Egypt by the Theban princes about 1600 B. C. With the expulsion of the Shepherd kings began the reigns of those great Theban kings who built the magnificent temples and palaces at Thebes.

The nineteeth dynasty began with Rameses I. Seti I, the successor of this Rameses, began a war against the Hittites, which was continued under his successor and grandson, the great Rameses II, or Sesostris. Until recently it was believed that Rameses II was the Pharaoh who had oppressed the Hebrews, and that the Exodus occurred under his successor, Menephtah. Under the later kings of the nineteenth dynasty, the Egyptian empire began to decay. The twentieth dynasty began with Rameses III, a strong king, who was followed by a succession of weak rulers, dependent for the most part on their priests. A priest dynasty, the twenty-first, came to the throne with Herhor. He attempted to restore Egyptian rule in the East and conquered Jerusalem. After his death Egypt was torn by civil war, and eventually the Ethiopians conquered it. In 525 B. C. Cambyses, king of Persia, overran Egypt and made it a Persian province. After the Persian defeat at Marathon, the Egyptians arose and recovered their independence for a short time, but were again subdued; and in spite of two other revolts, Egypt remained a Persian province until Persia itself was conquered by Alexander the Great in 332 B. C.

Egypt now became a Greek state, and the Egyptians were treated as an inferior race. Alexandria was founded as the new Greek capital. On Alexander's death, his general, Ptolemy, took possession of the throne and became the first of a Greek dynasty that for three hundred years made Egypt one of the chief kingdoms of the world. The Ptolemies were patrons of letters and art, and Theocritus, Callimachus and Euclid flourished under their rule. But while the Alexandrian Greeks managed to keep down the native Egyptians, they were themselves coming under Roman influence. The later Ptolemies were obliged to ask the help of Rome in internal and external troubles, and Cleopatra maintained her power only through her personal influence with Julius Caesar and Mark Antony. On the defeat of Antony by Augustus in 30 B. C., Egypt became a province of Rome. It was still a Greek state, however, and Alexandria was the chief seat of Greek learning and science. Gradually the old Greek and Egyptian religions gave place to Christianity, and this is perhaps the most important event in Egypt during the Roman rule.

On the division of the Roman Empire, in the time of Theodosius, into the Western and Eastern empires, Egypt became a province of the latter and sank deeper and deeper into barbarism and weakness. It was conquered in A. D. 640 by the Saracens, under Caliph Omar. Of the Saracen rulers who made Cairo practically the center of Mohammedan influence, the greatest was Saladin. The last Saracen dynasty was overthrown by the Mamelukes in 1250, and the Mamelukes in their turn were conquered by the Turks in 1517. They made repeated attempts to cast off the Turkish yoke, and they had virtually done so by the end of the eighteenth century, when Napoleon conquered Egypt. The French held it till 1801, when they were driven out by the Turks, with the aid of the British.

On the expulsion of the French, a Turkish force took possession of the country, and Mehemet Ali was made pasha. He was a man of great ability, administered the country vigorously and greatly extended the Egyptian territories. At length he rebelled against the porte, and, after gaining a decisive victory over the Ottoman troops in Syria, was acknowledged by the sultan as viceroy of Egypt, with the right of succession in his family. Mehemet Ali died in 1849 and was succeeded by his grandson Abbas Pasha, who in his turn was succeeded by his uncle Said Pasha, the son of Mehemet. Under the rule of Said Pasha railways were opened and the cutting of the Suez Canal was begun. After Said's death, Ismail Pasha, a grandson of Mehemet Ali, obtained the government (1863). His administration was vigorous, but exceedingly extravagant, and brought the finances of the country into great disorder. In 1866 he received permission from the sultan to adopt the title of khedive. In 1879 he was forced to abdicate under pressure of the British and French governments and was replaced by his son, Tewfik. The so-called national party revolted in 1882 and forced the khedive to flee, but on July 11 a British fleet bombarded Alexandria and restored him. From this time on, although the khedive remained the nominal head of the government, Egypt became practically the protectorate of Great Britain.

A rebellion in the Sudan, under the leadership of the Mahdi, now gave the government trouble. Troops were sent under General Gordon to protect the British interests, but the Mahdi's forces were strong enough to shut General Gordon up in Khartum. For nearly a year he held the town, but he was killed (January 18, 1885) before the relief expedition under Wolseley could reach him. When the expedition withdrew, the Sudan was left in a state of anarchy. In 1896 the Mahdi again threatened Egypt, and the British government again took steps to suppress him. Sir Herbert Kitchener was made commander in chief of the Egyptian army, and in 1898 he won a final victory, which once more brought the Sudan under the rule of the government. In 1892 Tewfik was succeeded by his son, Abbas Hilmi, an able ruler. The recent history of more than local interest appears in the subheading *Government*, above.

Related Articles. Consult the following titles for additional information:

GEOGRAPHY

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Cairo
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World War

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Mummy
Papyrus
Philae
Rosetta Stone
Scarab
Sculpture
Sphinx
Suez Canal

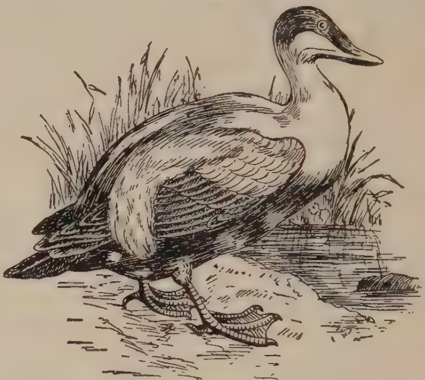
EIDER, *i′der,* **DUCK,** a species of duck found both in America and Europe. The birds abound in Norway and Iceland, where their favorite haunts are solitary rocky shores and small islands. The eider duck is about twice the size of the common duck. The male is for the most part black, but has a white back and head, with a black crown. The female is reddish, and spotted with black, and has two white bands on the wings. The nests are usually formed of drift grass and dry seaweed and are lined with down, which the female plucks from her breast. Eider down because of its warmth and lightness is in great demand for beds and coverlets. One female produces about half a pound of down.

EIGHT-HOUR DAY. See LABOR LEGISLATION.

EIFFEL, *i′fel,* **TOWER,** THE, designed by Gustave Eiffel, stands in the Champ de Mars, Paris. It was completed in 1889 and was designed as the leading architectural feature of the Paris Exposition of the following year. Its base is 330 feet square and the support is four iron columns which rest upon massive masonry. It is 986 feet high, the tallest structure in the world. There are platforms at 189 feet, 380 feet and 906 feet, which can be reached by elevators and by stairs. The first platform contains restaurants, the third is partially devoted to an experimental station of the weather bureau of France and to a wireless telegraph station, which was an object of attacking German aviators in the World War. The tower contains 7,300 tons of iron and steel and cost $1,000,000.

EIFFEL TOWER

Gustave Eiffel (1832–   ), a celebrated engineer, born at Dijon, France. He first attracted attention by the construction of a bridge, in which was employed for the first time the compressed air method of sinking foundation cylinders. This was followed by many other works of great engineering skill. The most important among these, and the one which has made his name famous throughout the civilized world, is the Eiffel Tower (see above). Eiffel was made an officer of the Legion of Honor in recognition of his genius. In 1893 he was connected with the Panama scandal, and was convicted of misappropriating funds of the canal company. For this he was fined and imprisoned.



EIDER DUCK

EKATERINA, *yeh kat ye re′na,* RUSSIA, a commercial port on the Arctic Ocean, built by the Russian government after the outbreak of the World War. It is situated 700 miles north of Petrograd and sixty-six miles east of the Norwegian border, at a point where the Gulf Stream mingles its waters with those of the Arctic. As a result the harbor of Ekaterina is free from ice the year round, in contrast with that of Archangel, which is ice-bound for six months. When the war broke out Russia found that the trade routes to the Atlantic by way of the Baltic were closed, and Archangel was not an adequate port for receiving supplies from the allies. Accordingly the new port was built far to the north.

E′LAND, the Dutch name for a large African antelope. It is the size of a full-grown horse. The animal is hunted for its hide, which is used for harness, and for its flesh, which is suitable for the table. It is gentle and easily captured, and consequently is becoming exterminated. See ANTELOPE.

ELASTICITY, *e las tis′i ti,* the property of matter by virtue of which a body tends to resume its original form when the outside force by which it was deformed is removed. Nearly all substances are elastic, but some are much more so than others. Gases are the most elastic, and liquids the least. Hard solids, such as iron, steel and marble, are more elastic than soft ones like dough, putty and lead. Whenever a substance is compressed or extended beyond the limit of its elasticity, it will not resume its former shape. This is often illustrated by rubber bands that have for some time been stretched to a high degree of tension. Such bands lose their elasticity. By compressing gases with a sufficient force, most of them can be changed into liquids. In some instances these liquids return to the gaseous form as soon as the pressure is removed, while in others they do not.

EL′BA, a small island in the Mediterranean Sea, belonging to the province of Leghorn, Italy, separated from the mainland by the Strait of Piombino, six miles wide. This island is eighteen miles long and from three to ten miles broad, and is traversed by mountains, which rise to a height of over 3,000 feet. It yields iron, marble, granite and salt, and produces grapes and other fruits. It has two seaports, Porto Ferrajo, the capital, and Porto Longone. The Treaty of Paris in 1814 made Elba a sovereignty for Napoleon, who lived there a prisoner from May 4, 1814, to February 26, 1815. He escaped and made his way back to France, assembled his armies and for a hundred days fought again for supremacy in Europe. See Napoleon I.

ELAND

EL′BE, a river of Germany, one of the largest in Europe. It rises on the slopes of the Schneekoppe, one of the highest summits of the Riesengebirge, between Bohemia and Silesia. Its length, including windings, is about 780 miles, and its mouth is on the North Sea, at the port of Cuxhaven. Its chief affluents are the Moldau, Eger, Saale, Mulde and Havel, and the chief cities on its banks are Dresden, Torgau, Wittenberg, Magdeburg and Hamburg. The Elbe is navigable for ocean vessels as far as Hamburg, which is thus a mighty ocean port, eighty miles from its mouth, and is connected with important cities in its basin by a network of canals. It is one of the most important commercial rivers in Germany.

ELBERFELD, *el ber felt′,* Germany, a town of Rhenish Prussia, fifteen miles east of Düsseldorf. Its prosperity, which is of recent date, is largely due to cotton manufacture. In normal years linen, woolen, silk and mixed silk goods, ribbons and velvet are extensively made and exported, and there are numerous mills for spinning cotton twist, linen yarn and worsted, besides numerous dyeworks and miscellaneous industrial establishments. The commerce is extensive, and Elberfeld is an important railway center. During the World War it became an important center for the manufacture of munitions, and its population had increased to 339,409 by 1918. In 1919 it was 157,218.

ELBURZ, *el boorz′,* a lofty mountain range, extending over Northern Persia, parallel with, and overlooking, the Caspian Sea. The highest peak is Mount Demavend, 18,500 feet; the average height of the range is 7,000 feet.

EL CANEY, *el kah′na e,* Battle of, a battle of the Spanish-American War, fought July 1, 1898, between 4,500 Americans, under General Lawton, and about 500 Spaniards, well-entrenched, under General Vara de Rey. The battle was one of the few important land contests of the war, was fought desperately and caused a loss of more than 400 men on each side. The Americans won the day. See Spanish-American War.

EL′DER, a name given to several species of small trees or shrubs, which have opposite leaves, with finely-cut edges, and bear small white flowers in large conspicuous flat-topped clusters. The berries are black or red in color and somewhat bitterish in taste, though they are sometimes used in making pies and a kind of wine. Some varieties of elder are cultivated because of their beautiful foliage and handsome shape. The branches are woody on the outside, but the whole center is filled with a white pith. The wood of the European species is tough and hard and takes a good polish.

EL DORADO, *el doh rah′doh,* a name severally applied to a former king of South America, to a fabled gold city and to a country reputed to be immeasurably rich. The Spaniards spent large sums of money in attempts to discover the city and country; the most noted expeditions were those of Diego de Ordaz in 1531. The name is now used to designate any place of fabulous wealth.

ELECAMPANE, *el e kam pane′,* a plant of the natural order Compositae, found in North America, Europe and Asia. It is three or four feet high and has root leaves often two feet or more in length. The flowers are large and yellow. The root, which is perennial, and possesses a bitter, camphor-like taste, is used in the manufacture of absinthe.

ELECTION, *e lek′shun,* in government, is the process by which officers are chosen to manage public affairs. Some of these secure their positions by appointment, and not by election; the number actually elected is decreasing from year to year, as better means of securing responsible government are adopted.

That the will of the majority shall always prevail, and that votes shall be uninfluenced so far as safeguards can protect them, elections are conducted by secret ballot. The best system of balloting yet tested is the Australian ballot, which provides punishment for the person found outside his voting place with a legal ballot in his possession.

As a general rule only citizens may participate in an election. However, in some states aliens who have received only their first naturalization papers may vote in all state elections. This results in their legal participation in the election of members of the United States House of Representatives, for the Federal Constitution declares that any person qualified in the state to vote for state representative the United States government will accept as a qualified voter for Representative in Congress.

In no state may a person vote until twenty-one years of age; no lunatic may participate in an election, neither may a person who is under the influence of liquor. In case of removal from one state to another a residence there of one year is usually required to establish the right to vote; in a county, thirty days, in a township or ward, ten days, is required, if removal is from one county, township or ward to another in the same state. In times past, when women lacked legal standing, a female citizen was called *citess.* There is now no law, however, limiting the word *citizen* to mean males. In states where election privileges are restricted to males, such designation is clearly made. Wherever women are given the right to vote, the word *male* is stricken from existing laws or constitutions, and women are then legally recognized as on the same political plane as men.

People are called upon to vote upon other matters than the election of men and women to public office. When a city, village or county wishes to borrow a large sum of money and issue bonds for payment at a future date the voters at an election determine whether it shall be done.

Each political party in most states now selects from a mass of candidates those it desires to nominate for public office, by submitting their various merits to party vote in what is known as a *primary* election. In some jurisdictions no law may be placed upon the statute books until the voters, by referendum, have approved it. Sometimes, too, they are called upon to decide whether an official shall be removed from his position because of alleged misbehavior or failure to conduct properly the affairs of his office. The law providing for such an election is known as *recall.*

Related Articles. Consult the following titles for additional information:

Australian Ballot
Ballot
Citizen
Electoral College
Initiative
Naturalization
Primary, Direct
Recall
Referendum
Short Ballot
Voting Machine
Woman Suffrage

ELECTIVE STUDIES, a term that has come into common use in recent years to indicate courses of study in high schools and colleges which may be chosen, or elected to be taken, by the students. The development toward election has been slow, and there have been notable reactionary movements, but few institutions now adhere absolutely to one unchangeable curriculum. The advantage of the elective system is the freedom which it gives students to develop along the lines of their special strength or inclination. The danger lies in abuse of this freedom—the election of courses that are easy but have little disciplinary or instructional value. To obviate this disadvantage, several methods have been used, such as the division of the courses into groups, each student being required to choose a certain amount of work from each of these groups, and the assignment of members of the faculty as advisers to the students. Practically all of the American state universities have adopted the elective system, and most of the new privately endowed institutions, as well as some of the older ones, are rapidly extending their elective courses. The proportion of elective courses offered varies from one-fourth to one-half of the whole course.

ELECTORAL COLLEGE, in the United States, a body of men chosen by the qualified voters of the several states to elect the President and Vice-President. The number of electors chosen by each state is equal to the whole number of members that the state sends to both houses of Congress. No Senator or Representative or person holding an office of profit or trust under the United States can be chosen as an elector.

The day on which electors are chosen must be the same in all states—the Tuesday next after the first Monday in November. This is the day on which it is incorrectly declared that we vote for President and Vice-President. The electors thus chosen in November meet in their respective states on the second Monday in January and vote by ballot for President and Vice-President. They then make distinct lists of all persons voted for as President and Vice-President, and of the number of votes for each; these lists they sign, certify and transmit, sealed, to Washington, directed to the president of the Senate, who opens them in the presence of both houses of Congress, on the second Wednesday of the succeeding February. A majority of the whole number of electoral votes is necessary to elect.

If no candidate for President has a majority of votes, the House of Representatives must choose for President one of the three persons having the highest number of votes. The Senate in turn, will then choose a Vice-President. The electors no longer use discretionary powers, as planned by the Constitution makers, but cast their votes for the candidates previously nominated by their respective parties. See PRESIDENT; VICE-PRESIDENT.

ELECTORAL COMMISSION, a commission appointed by an act of Congress in 1877 to investigate the returns of electoral votes from Florida, Louisiana, Oregon and South Carolina, by which would be determined the Presidential election of 1876. The commission numbered fifteen members, consisting of three Republican Senators, two Democratic Senators, three Democratic Representatives, two Republican Representatives and five Associate Justices of the Supreme Court.

It was apparent that the commission was evenly divided between the two parties, with the exception of the fifth justice, Bradley, who had taken the place of Justice Davis of Illinois. However, he cast his vote with the Republican members and decided against the Democratic claim that the commission should go behind the returns and investigate charges of fraudulent voting and manipulation of returns. This point being determined, the commission in every case sustained the validity of the Hayes electors, thus deciding the election in favor of Mr. Hayes and against Mr. Tilden. See UNITED STATES OF AMERICA, subhead *History*; HAYES, RUTHERFORD BURCHARD; TILDEN, SAMUEL JONES.

ELECTORS, GERMAN IMPERIAL, those German princes who had a voice in the election of the German emperor (see GOLDEN BULL). Originally the number was seven, but in 1648 it was increased to eight and in 1692 to nine.

ELECTRA, *e lek'trah*, in Greek legend, the daughter of Agamemnon and Clytemnestra, the sister of Orestes and Iphigenia. She does not appear in Homer, but was a favorite character in later literature. Her story is the subject of plays by Aeschylus, Euripides and Sophocles. There are many variations in the treatment of the legend, which, in its broad outlines, is as follows: After the murder of her father on his return from the Trojan War by Clytemnestra and Aegisthus, Electra saves the life of Orestes by sending him out of the country. Grown to manhood Orestes returns and slays both Clytemnestra and Aegisthus.

ELEC'TRICAL FISH, any fish that gives an electric shock. One of the best known is the electric eel, a native of South America. It is of nearly equal thickness throughout and grows to the length of six feet. A species of catfish about four feet long that lives in the Nile, and several species of torpedoes, one of which is sometimes found on the eastern coast of the United States, are electric. The seat of the four organs that give the shock is believed to be on the under side of the tail. After a few discharges, the current is weakened, and an interval of rest is required for a new storage of force.

ELECTRIC EEL

ELECTRIC CATFISH

ELEC'TRIC BAT'TERY, also called *galvanic battery* and *voltaic battery,* a device for generating electricity by chemical action (see ELECTRICITY, Subhead *Voltaic*). The simplest form of an electric battery consists of a tumbler or cup, partially filled with water, to which about a tablespoonful of sulphuric acid has been added, and in which a strip of zinc and a strip of copper have been so placed that they do not touch each other beneath the surface of the liquid. When the strips of metal are joined at their upper ends, either by placing them together or by connecting them with wire, chemical action occurs between the water and the zinc, and electricity is generated. The wires are called *poles* or *electrodes,* the one attached to the copper being the positive (+) and that attached to the zinc, the negative (—) electrode. See ELECTRICITY, subhead *Positive and Negative.*

There are various patterns of electric batteries, but in all, the cups or cells are the units for small batteries, and tanks are the units for large batteries. The principle upon which the battery acts is that of having two substances, of different electrical potentiality, immersed in the liquid, upon one of which it acts. One of the most common patterns is the cell used for ringing door bells and operating telephones. This consists of a glass cup, containing a solution of sal ammoniac in water, into which is placed a strip of zinc and a plate of carbon. See BUNSEN'S BATTERY; DANIELL BATTERY.

Dry Battery. What is known as a *dry* battery is made on a similar plan, but the liquid is mixed with starch and glue into a paste, so that it will not spill if the cup is overturned. Dry batteries have increased in popularity until they are almost exclusively used for a great variety of purposes. They are easily portable and are relatively inexpensive.

How to Make a Battery. The first requirement is to secure suitable tools. It is not necessary to begin by purchasing an elaborate set. Little by little, additions can be made as they are needed. Still, here are certain tools that are indispensable:

1 large pocket-knife.
Fine pen-knife.
Drill and bits.
Pair of cutting pliers.
Pair of large scissors for cutting metal.
Pair of small scissors.
Several files, large and small.
Hammer.
Mallet.
Brad awl, gimlet, pincers.
Small bench vise.
Small saw.
Soldering iron.
Spirit lamp.
Wheel glass cutter.
Pair of compasses.
A two-foot or three-foot rule.

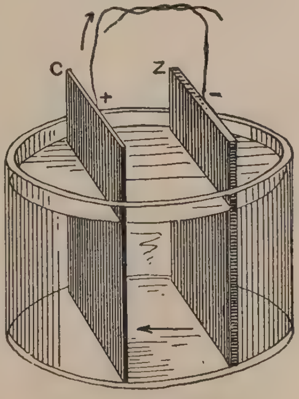
Of course, such tools as planes, chisels, screwdrivers, will always be used. A pair of old gloves will be found useful, especially when working with batteries.

If the amateur plans to keep a little stock of materials and tools as he needs them, and especially if he keeps his workshop in order, he will do better work than if he has many useless tools but is careless and slipshod. The following materials, however, should be kept on hand:

Glass rods, from ⅛ in. to ½ in. in diameter.
Ebonite rods, from ⅛ in. to ½ in. in diameter.
Glass tubes, from ⅛ in. to ½ in. in diameter.
Guttapercha.
Glass bottles.
Sheets of glass; every piece is useful.
Tinfoil.
Sheet zinc and sheets of tinned iron (such as clean beef tins or sardine tins, which may be cut into pieces).
Sheet copper and brass.
Brass rod, about ⅙ in. in diameter.
Solder and soldering iron.
Chloride of zinc, rosin, needles, watch springs, white hard varnish, red lead, glue, copper wire of various sizes (better buy as needed), and at least a dozen telephone terminals or binding posts for making good connections.

Simple Forms. We are now ready to study some of the simpler forms of cells and their arrangement into batteries. Cells may be classified as single-fluid and double-fluid. To the first class belong all such as do not require a partition of any kind between the fluids surrounding the two plates (or "elements") in the cell.

The second class includes all those in which the fluids are kept from mixing directly. This may be done by a porous cup, sawdust, sand, difference of specific gravity or weight, etc. Most of the materials can be purchased cheaply from any reliable electrical supply house. Many of them can be made or found at home. Old glass fruit jars can always be used as containers. Acid-proof cells may be constructed by gluing together with good tape, stout brown pasteboard in any size or form required. After they are thoroughly dry, these cells must be soaked for a few minutes in hot melted paraffin wax, and then allowed to dry and harden. Cells of this kind will withstand any acid, and even a solution of copper sulphate. Porous cups for the double-fluid cells are cheap, but they can also be made from any good, clean yellow clay, kneaded to free it from stones. This may be moulded to the desired shape, allowed to dry perfectly, and then gradually heated to redness in any ordinary fire. The addition of powdered graphite or even charcoal will improve the quality.



A SIMPLE BATTERY OR CELL

The simplest cell is known as the "simple voltaic," named after Volta, an Italian physicist. This consists of two plates, one of sheet zinc, the other of sheet copper (or graphite) set in a mixture of twenty parts of water to one part of sulphuric acid. Every cell is composed of two elements, positive and negative. The positive element in this case is copper; that is, it is the element from which the current is supposed to start. It is the element which remains; the zinc decomposes if left in an active battery for a great length of time. If two negative plates (i. e. zinc, graphite, etc.) be used, one on each side of the positive, much better results will be obtained. To hold these plates in position a simple device is the following: Cut several strips of paraffined wood, ⅛ in. thick and from ½ in. to 1 in. wide, according to the size of the battery, a little longer than the diameter of the containing cell. With the aid of a binding screw or clamp, these strips may be held between the tops of the plates in the cell.

It is better to make wooden covers for cells. These can be cut from pieces of board one inch thick. They should be cut a little larger in diameter than the top of the jar, and made into as true a circle as possible by filing round the edges with a rasp. Round the edge of the cover draw a line ½ in. from the top; then with a flat rasp or file make a shoulder by rasping away the wood on one side of this line for a depth of ⅜ in., so that the cover can enter loosely into the neck of the jar and rest on the shoulder. The cover should be soaked in melted paraffin wax, till bubbles cease to appear, evidence that the wood is now waterproof and will act as insulator. It will now be necessary to bore holes through which the wires from the plates in the cell may pass. To hold the wires regular "terminals" or binding posts should be used, if possible. For amateur work in general it is better now to connect the "negative pole" (that is, the wire coming from the copper plate) of one cell with the positive pole (that is, the wire coming from the zinc plate) of the next. These wires should be soldered to the plates or otherwise fastened so that the connection is clean.

A useful cell for amateur work is known as the "chromic acid cell," which gives a heavy current for a short time. Two carbon plates and one zinc plate give excellent results. The zinc plate must be amalgamated by moistening with diluted sulphuric acid (1 part acid to 20 parts water), a drop of mercury being put on the surface of the plate while the rubbing is going on. The zinc must be polished till it shines, then rinsed and allowed to dry. To charge the cell, the following mixture may be used:

Chromic acid	6	oz.
Water	1	qt.
Chlorate of potash	½	oz.
Oil of vitriol (sulphuric acid)	6	oz.

Dissolve the chromic acid in water; add the chlorate of potash, and stir till dissolved; then add sulphuric acid slowly and allow the mixture to cool.

When not in use the plates should be removed from the cell, kept in boiling water for five minutes, then allowed to dry. Extreme care should be used in handling sulphuric acid, to avoid splashing, as a drop of this acid on the hands will cause a bad burn.

To give a list of all cells made to-day is impossible. Different manufacturers give different names to cells which are essentially the same. Practically all cells in commercial use to-day use zinc as the negative element; it is with the positive element and with the exciting fluid that new combinations are formed. There are a number of standard cells, however, which are of use to the amateur and may be bought from any dealer. Below are a few of the better known:

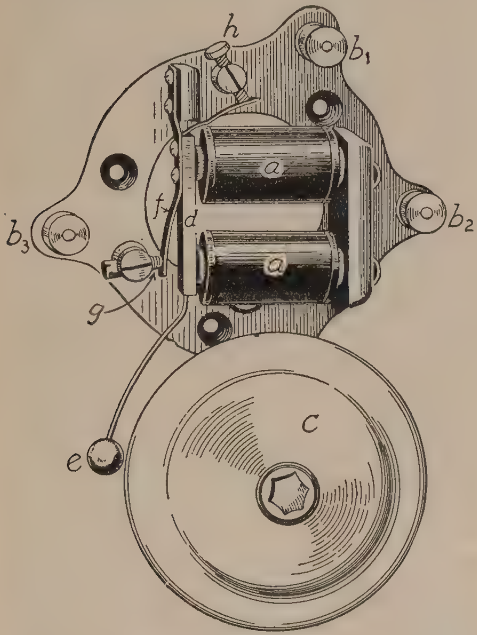
NAME OF CELL	NEGATIVE	POSITIVE	EXCITING FLUID
Bunsen	Zinc	Graphite	Diluted sulphuric acid
Daniell	Zinc	Copper	Zinc sulphate solution
Grove	Zinc	Platinum	Diluted sulphuric acid
Lalande	Zinc	Copper or Iron	Caustic potash solution
Leclanche	Zinc	Graphite	Ammonium chloride solution

Dealers' catalogs and books will give information about dozens of other cells. In putting together a double fluid cell care should be taken that the plates do not touch each other. One plate must be set in the porous cup and the other in the container. The ingenious boy will easily arrange these details when he has the materials at hand. In any case, it is wise to ask advice of experienced electricians, who will always be glad to answer intelligent questions.

A Storage Battery. No doubt every boy has heard of a storage battery and has wondered how to make one. For connecting door bells and other uses for which a current is necessary for a long time, a storage battery should be used. It must be charged from a working battery, but it has then stored enough electricity to serve a long time. Take two sheets of $\frac{1}{16}$ in. lead, each about 6 in. wide and of any convenient length. Place one on a flat table, then place lengthwise on this sheet three strips of india-rubber (asbestos cloth or other insulator), but only ½ in. wide, at equal distances from each other. Over these lay the second lead sheet, over this three more rubber strips. Roll the sheets into a tight spiral on a wooden cylinder and solder a strip of lead or "lug" to one end of each sheet to make connections. A glass or glazed earthenware jar should now be fitted with a cover of paraffined wood, such as has already been described, with two small holes for the connections. The spiral should be tied together on the outside with a guttapercha or india rubber band. Pour a mixture of ten parts of water to one part sulphuric acid into the jar and then insert the spiral. In mixing sulphuric acid with water it must be remembered that the *acid* must be added in a fine stream to the water, and must be stirred, preferably with a glass rod. Never add water to the acid. We now must "form" or "charge" our battery. A current of electricity must be passed into it until small bubbles show themselves at one of the plates. Then reverse the current by reversing the wire connections. This process will probably take a week or more, till the sheets have become sufficiently spongy to hold a considerable charge. An easy way to shorten the time of "forming" is to dress the surface of the plates with a paste made of red lead and sulphuric acid before rolling the sheets. Two or three charges will then probably be enough to "form" the storage battery.

ELECTRIC BELL, a bell rung by electricity, which is provided by an electric battery, usually a dry battery, from which wires run to the bell. A push button opens and closes the circuit. The current employed excites an electro-magnet, attracting or releasing an armature which is attached to a vibrating or pivoted arm, on the end of which the knocker is fastened.

The principle of the best electric bells is shown in the illustration. The magnetizing coils are *a a*, and they are connected with their terminals at binding posts b_1, b_2. When these binding posts are connected with the electric current and the circuit is closed, the armature (see Armature; Dynamo), at *d*, will be attracted, and will push the hammer *e* upon the bell. When the armature is attracted, the spring *f* leaves the screw contact *g*, against which it rests. This screw contact is wired with the binding post b_3 in such a manner that if the binding posts b_1 and b_3 are connected with the circuit, instead of b_1 and b_2, the circuit will be automatically interrupted as soon as the armature leaves contact *g*. This will cause the magnetic force to disappear and the armature to return, thus closing the contact. When the contact is regularly reëstablished and broken the armature will be continually attracted and repelled. The screw *b* is turned to adjust the tension of the spring.



AN ELECTRIC BELL

ELECTRIC CLOCK, a clock driven or controlled by electricity. The common method of regulating clocks by electricity is to attach to each a device, consisting of an electro-magnet attached to a clockwork, which will cause the clock to be wound at frequent intervals, so that the motive power by which it is run will not vary. Some electric clocks are so connected with a central timepiece that the hands are adjusted at frequent intervals to agree with those of the regulating clock; but the most successful plan is to have all the clocks in the system operated from the regulating clock. In such a system there is but one complete clock, and all of the others are simply dials, with such wheelwork attached as is necessary to give the proper motion to the hour and minute hands. See CLOCK.

ELECTRIC HEATING. When an electric current is made to pass through a conductor that offers great resistance, the temperature of the conductor is raised.

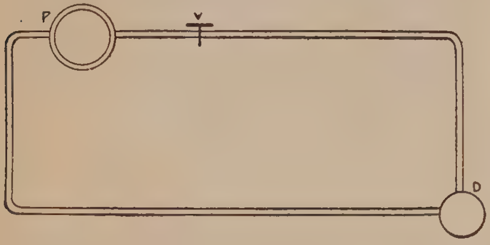
The possibility of heating by electricity lies in the fact that materials of high resistance can be heated to higher temperatures by an electric current than can materials of low resistance. In the simplest form of heaters exposed coils of wire are wound around insulating material, which takes any desired form. Electricians have taken advantage of this fact to use electricity for heating, cooking and welding. The current meeting resistance, heats the wire. If there were no substance present to convey off this heat the wire would fuse or weld, but the enamel carries off the heat generated, and the current continues to pass along the wire. In practice, the enamel plates, with the wire buried in them, are placed in ovens, on the bottoms of kettles, pans and other kitchen utensils, in broilers, gridirons and on the polishing surface of flatirons. By this means frying, boiling, baking, broiling and stewing are performed by the heat produced by electricity. To heat a room there is placed behind the heated coil a metallic reflector which spreads the heat forward into the air of the room. See WELDING.

ELECTRICITY, *e lec-tris′-i ty,* a remarkable form of energy which has within recent years revolutionized many branches of industry.

If a warm lamp chimney is rubbed with a piece of silk, or if a stick of sealing wax is rubbed with flannel it will attract light bodies, such as bits of paper, small pieces of excelsior and sawdust. Numerous other substances, such as hard rubber, resin and gutta-percha, show the same peculiarity. This characteristic of certain substances was discovered in amber, a substance which the Greeks called *electron*, by Thales, a Greek philosopher who lived six hundred years B. C. From this instance, we obtain the word *electricity*.

An Illustration. Before we study some of the uses to which electricity can be put, we should try to understand its nature. Many years ago people believed it to be an invisible fluid. So we still speak of currents of electricity, just as we speak of currents of air or of water, though we have long since realized that the expression is only a comparison.

Let us see where this resemblance lies. Our diagram represents a pump P, from which flows a stream of water controlled by a valve V. When we open the valve V, the signal apparatus D enables us to perceive the flow of water. Thus we see the "circuit" completed or "closed." When we close the valve the stream of water ceases to flow. Meanwhile, the pump drives a steady stream of water; in other words, it supplies a water-driving or water-motive force.



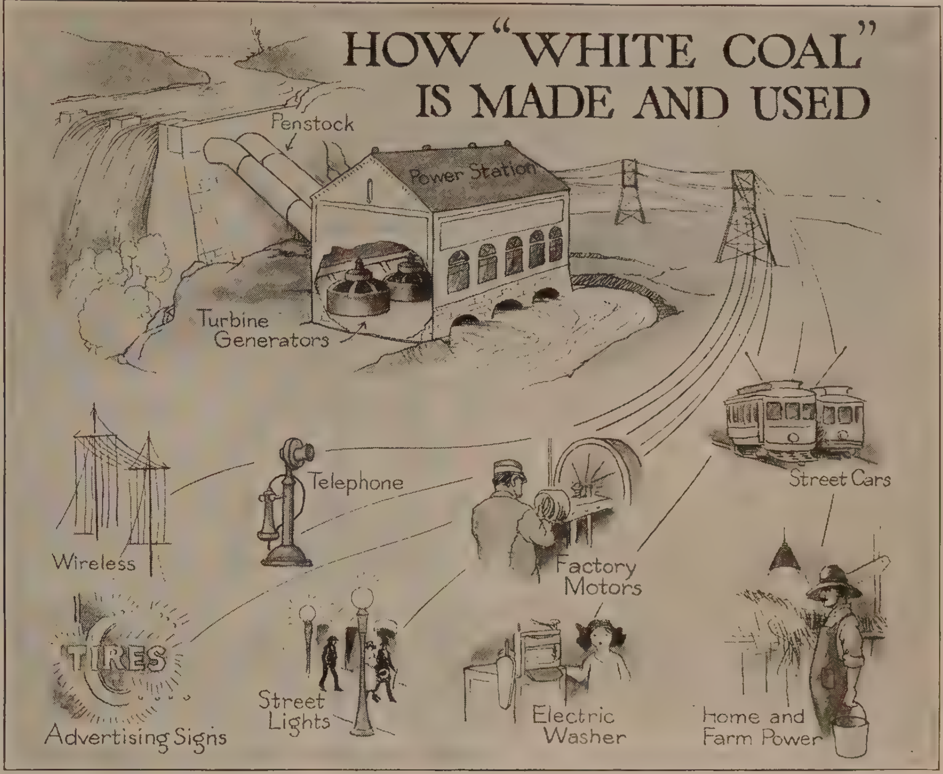
Instead of the water "circuit" let us now study the simple electric circuit. We have wires instead of pipes; a battery instead of a pump, a transmitting (or sending) key instead of a valve; instead of the signal apparatus D we have a "receiver" or "sounder;" instead of water we have electricity. Before, we had water-motive force, now we have electro-motive force. If we apply pressure to a stream of water, the particles of water will first resist, then slowly change their course. These tiny particles are called "molecules," from the Latin word *moles* meaning *mass*, and the ending *culus* meaning *small*. In much the same way a wire and the air about it resist an electric current. If the molecules yield quickly and take up the electricity we speak of a "low resistance." Just as a long small pipe will offer considerable resistance to a large stream of water, so a long thin wire offers a "high resistance" to an electric current. Thus we see that the electric circuit is very much like the water circuit. Yet it must be remembered that electricity is not a real fluid, like water.

What Electricity is. For centuries electricity was considered a peculiar property, possessed by few substances. It was interesting only on account of the strange effects which it produced, and it is only since about 1840 that it has been turned to practical use. Many theories concerning electricity have been advocated, only to be abandoned as a fuller knowledge of the subject showed their inability to explain its effects. While scientists do not claim to understand fully what electricity is, they probably know as much about what it is as they do about what heat and light are, and they are now generally agreed that electricity is a form of molecular motion. This motion is supposed to be different from the motions which produce heat and light, just as its effects are different, but the effects of all these motions are carried in much the same way.

The Electron Theory. Scientists have established the electron as a particle of matter so infinitesimal that it has only about one-thousandth of the mass of a hydrogen atom. The mind can never grasp the relative insignificance of this little particle, but an illustration will be helpful.

Write the figure 4 and follow it with twenty-six 0's; this represents approximately the number of molecules of hydrogen in one grain, by weight; the number of atoms would be twice as great, for there are two atoms of hydrogen in one molecule. You may think we have thus named about the smallest particle of matter in existence, but scientists tell us that the electron is so small that 2,000 of them are required to equal one hydrogen atom in weight; they further tell us that these electrons are the source of everything electrical.

Electrons are always electrically charged; it is firmly believed that an electron itself is actually an electrical charge. It is known that all electrons contain equal electrical charges; this is the smallest electrical charge known to exist. Scientists therefore call the amount of electricity in each electron the *elementary electrical charge*. A current of electricity, then, consists of uncountable numbers of electrons passing from one atom to another of a material which is a good conductor (see subhead, *How Electricity Travels*, below). This electron theory is held by most authorities; time will either confirm these present beliefs or entirely



Whatever the duration of our supply of coal and oil, there is no doubt of the rapidly increasing cost of these fuels. We must have more and cheaper power. There is everywhere, or within reach, a source of never-failing power. The rivers of North America represent a force, if harnessed, equal to the hard daily work of 1,800,000,000 men. Every year we are using more and more of this water power to generate electric power. At Niagara alone 580,000 horse power are now generated. A horse power equals the hard steady work of ten men (when those ten men feel like working).

Courtesy Niagara Falls Power Company.

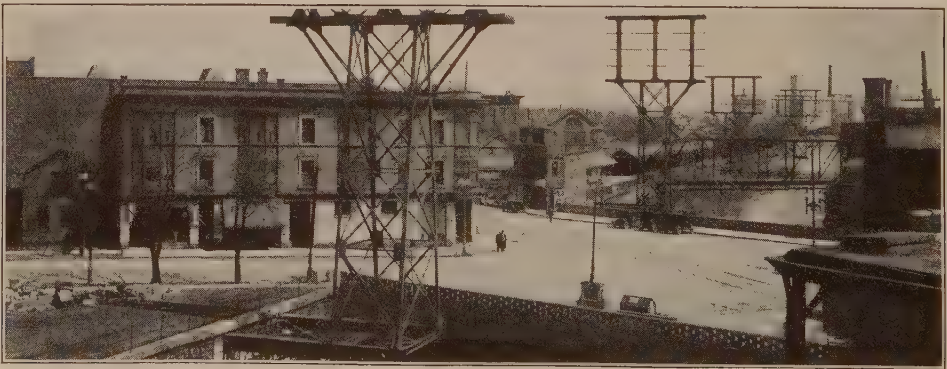
Through these huge tubes rushes the water after a 215-foot drop from the Niagara River above the Falls. The water whirls the turbines that operate the dynamos that generate 130,000 electric horse power that furnish light, heat and power for the factories and homes of a great city.

Courtesy Niagara Falls Power Company

These generators produce 37,500 electric h. p. each. Since no eight-hour day limits them, they work twenty-four hours a day, 365 days a year, as long as the river flows. When we shall have harnessed all the flowing rivers of the country we shall have no further need of BLACK coal.

Courtesy Niagara Falls Power Company

When electric current is to be transmitted a long distance the voltage or "punch" must be raised, or "stepped-up." In this transformer room the voltage is stepped-up from 1,200 to 22,000, so that the current may be distributed with the least waste or loss to cities, towns and villages over a wide area.



Courtesy Niagara Falls Power Company

The five stations of the Niagara Falls Power Company now generate 410,000 horse power. The engineers of this Company had to solve the problem of how best to transmit a current of high voltage through a compactly built city. Note the ingenious use made of the space over the diversion canal, which brings water from above the Falls to the turbines below.

change opinions as to the identity of electricity.

How Electricity is Produced. The experiments with the lamp chimney and the sealing wax, to which attention was directed, show that one way of producing electricity is by friction. There is also another way—by chemical action. On account of these two general sources from which electricity is derived, it was formerly classified under two heads, *static,* or *frictional,* electricity, and *galvanic,* or *voltaic,* electricity. Notwithstanding the fact that a more complete knowledge of the subject has shown that there is no good reason for this division, it is still followed. See NIAGARA FALLS.

Frictional, or Static, Electricity. This is the name applied to all electricity produced by friction. When glass, rubber, sealing wax and other substances are rubbed, they become electrified, or charged, and will attract light bodies, such as bits of paper and sawdust. Many similar experiments prove that electrified bodies possess the power of attracting certain other bodies. The electric force accumulates at the ends of the bodies, which for this reason are called poles; therefore, electrified bodies, except spheres, show polarity.

Positive and Negative Electricity. If we present the sealing wax to the glass tube, the two objects will attract each other, but two electrified glass tubes or two electrified sticks of sealing wax will repel each other. A pith ball, suspended from a silk thread so that it will be between a glass tube and a stick of sealing wax, both of which are electrified, will vibrate rapidly between them. If we should present the tube and the sealing wax to bits of paper, we should find that these would fly first to one and then to the other. Numerous experiments show that these bodies are differently electrified, and that bodies similarly electrified repel each other, while those oppositely electrified attract each other. The terms positive (+) and negative (—) are used to indicate these different conditions. The glass when rubbed with silk is positively electrified, while the sealing wax when rubbed with flannel is negatively electrified.

How Electricity Travels. Electricity travels through some substances easily, while there are others through which it will not pass at all. Substances of the first class are called *conductors.* All metals, most liquids, animal tissues and the earth are good conductors, silver and copper being the best. Substances of the second class are called *nonconductors,* or *insulators.* Glass, resin, rubber, dry wood, dry air, silk and woolen are illustrations of good insulators. No sharp line can be drawn between conductors and insulators, as there are numerous substances, such as damp air or unbaked wood, through which some electricity will pass. These substances are both poor conductors and poor insulators. Electricity passes through a conductor from molecule to molecule, the same as heat passes from one end of an iron rod to the other.

A body which is a good conductor cannot become electrified unless it is placed upon an insulator as the electricity passes off as fast as formed. One cannot electrify a brass rod while holding it in the hand, but by suspending it by a silk cord or laying it on a tumbler, so as to insulate it, and rubbing it with silk, it may be electrified.

The electrical condition of a body is called its electrical *potential,* which means the same as electrical pressure. The more highly electrified a body is, the higher its pressure, or potential. When two bodies of unequal potential are connected by a conductor, their potential is equalized by a flow of electricity from the body having the higher to that having the lower. As static electricity tends to escape into the air, the conductor serves a useful purpose by preventing it from so doing, the same as a pipe carrying water keeps the liquid from spreading over the surface along which it flows. This flow of electricity is called a current, but it is a current of force, merely. Positive currents of electricity flow from bodies having a high potential to those having a low potential, while negative currents flow from bodies having a low, to those having a higher, potential.

Induction. Bodies become electrified in two ways; by direct contact with the electrifying agent, as in the case of friction, and by being brought into the presence of an electrified body. The second method is known as *induction.* It is found that all electrified bodies influence the atmosphere surrounding them. If an electrified glass tube be brought near an electroscope, the arms immediately separate; when the tube is withdrawn, the electroscope returns to its former position, showing that it did not receive any charge from the electrified body. A body can be charged by induction, however, by removing the opposite electrification. This is due to the fact that when an electrified body is brought near an object, it induces the opposite kind of electrification on the side next to it and the same kind on the opposite side. The principle of induction is used for charging nearly all electrified bodies, either for laboratory or practical purposes.

Electric Discharge. Whenever the nonconductor between two oppositely electrified bodies breaks down and the current passes through the intervening space, it is called a *discharge.* The nature of the discharge depends largely upon the shape of the conductor and the nature of the insulating medium. When the conductors present a rounded surface, like two balls, and an insulating medium, such as the open air, offers a good degree of resistance, the discharge is in the form of a spark, which takes a zigzag course, because it follows the line of least resistance. If, instead of two balls, two oppositely electrified points are held near each other, the discharge flows steadily, and in a dark room and with a strong current it appears as a brush of purple light. If the resistance of the air is removed by enclosing these points in a vacuum, the effect is much stronger. Lightning is an effect produced by a discharge through the lower layers of the atmosphere, and it corresponds to the first effect described; the aurora borealis is caused by a discharge through the upper regions of the atmosphere, and corresponds to the second effect. A practical use of this discharge is seen in the arc light.

Voltaic Electricity is electricity generated by chemical action. It was so named from Volta, who constructed the first apparatus for its production. Voltaic electricity is very convenient for many purposes for which static electricity is not suited, on account of the expense of maintaining a constant current by the use of a dynamo electric machine. Some of the most common uses are in ringing doorbells and in operating electric signals, the telegraph and telephone.

Effects of Electricity. The effects of voltaic and static electricity are practically the same, and the great advance made in the application of electricity to the arts has been because of the discovery that static electricity can be used for many purposes for which only voltaic electricity was formerly supposed possible. The effects of electricity may be classed as mechanical action, heat, light and chemical action.

The Future of Electricity. So widely does the electric current minister to our needs that the present time is popularly called the "Electric Age." Yet it is undeniably true that we are not far past the beginnings of the triumphs of man in his application of this remarkable power. Steam power is rapidly passing; manual labor is lessened already very materially. Notwithstanding all that has come to pass, those who know advise us that the wonders of the future will surely eclipse anything that has amazed the present generation. Within a comparatively-brief time city homes will be heated by electricity at low cost; steam locomotives will eventually be supplanted by those with electrical power, as is already true on numerous short lines. The housewife will have many new electrical devices which will eliminate labor; the workman will turn electric switches and find much of his labor performed by this unseen power.

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Volt
Volta, Alessandro
Watt
Welding

ELECTRIC LIGHT.

ELECTRIC LIGHT. Millions of fathers and mothers living to-day remember well the time they first saw an electric light. They marveled at a wonderful power that in an unbelievable way traveled along a small copper wire and inside a small plain glass globe turned night into day. The light sputtered and crackled, denoting that man had not yet perfected the new invention, but even then it outshone two hundred times any other illumination. Now, when steady-burning, powerful lights, shaded in porcelain globes, are among the commonest objects in all cities and even in many small villages, it is difficult to realize that until 1870 this indispensable utility was practically unknown. Not until 1885 did its use rapidly increase. The small lamps we know as *incandescent* lights, with which residences are equipped were not known until a number of years later.

Electric light is obtained through heating a suitable substance, as carbon, to incandescence, by causing an electric current to pass through it. The principle of the electric light was discovered by Sir Humphry Davy in 1810. He found that when two pieces of charcoal, which are connected with opposite poles of a powerful electric battery, were pressed together, a flame appeared between them. This was the origin of the electric arc light, but the expense of the material consumed in the batteries made a practical application of this method of lighting at that time impossible. An electric light, however, was introduced into the lighthouse of Dungeness, on the southern coast of England, in 1862, and it continued in use for a number of years; but it was not until the invention of the dynamo in 1870 that the electric light, improved by Charles F. Brush, became possible for commercial purposes. There are now three systems of lighting in general use, known as the *arc light,* the *incandescent light* and the *vapor light.*

Arc Light. The arc light is the oldest and was for a number of years the only kind of electric light in use. The most ordinary kind of arc light is produced by bringing the points of two sticks of carbon together and connecting them with opposite poles of a powerful electric current. When the current is turned on and the circuit completed, the points of these carbons are separated a short distance and a brilliant flame appears between them. The apparatus for an arc light consists of a frame for holding the carbons, and an electromagnet, attached to the holder of the upper carbon. As soon as the circuit is completed, the current passes through this magnet, withdraws the positive pole to the proper distance, and maintains it in this position as long as the light is in operation. If an alternating current is used, particles of carbon pass for a part of the time from the lower to the upper carbon and both points maintain their shape and size; but with a direct current the particles pass from the upper (positive) to the lower (negative) carbon, and the positive point becomes hollow at the end, while the negative maintains its shape.

Incandescent Light. The incandescent light, which was introduced by Thomas A. Edison and other inventors is produced by passing a current over a small conductor, which is raised to a white heat. The conductor in the ordinary lamps consists of a thread of carbon and is enclosed in an egg-shaped glass, from which the air has been exhausted. Within recent years tungsten has largely superseded carbon (see below). The incandescent lamp possesses several advantages over the arc lamp for lighting interiors. Its light is extremely steady, its temperature is low and the color of the light is more like that of the sun. Incandescent lamps can be placed in any position desirable, and they do not vitiate the air by their combustion. For these reasons, and also because they are less expensive, incandescent lamps are quite generally used in lighting buildings, and in some instances they are employed for lighting streets, especially where the current has to be brought a long distance.

The Nernst Lamp. A pattern of incandescent lamp, known from its inventor as the Nernst lamp, consists of a small nonconductor, known as the *glower* which is placed in the top of a globe from which the air has not been exhausted. This lamp gives a particularly soft white light, which is pleasing to the eye and is evenly diffused. A Nernst lamp is also more brilliant than the ordinary incandescent lamp of the same size. These lamps are losing their favor since the tungsten lights were introduced.

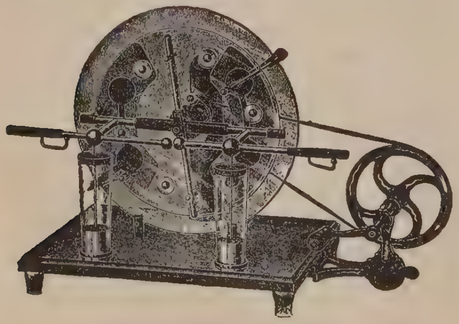
The Tungsten Lamp. When tungsten came into use as a filament material its superiority over all other filaments was at once recognized. The melting point of tungsten is extremely high—about 3200° C.; it is a very hard and dense metal, and can be heated until fairly soft before evaporation becomes noticeable. The old carbon lights contained but one loop of wire inside the glass globe; the tungsten filament requires a more complex mounting of wires because at its temperature when the light is burning the metal softens somewhat. The tungsten mounting consists of four lengths of copper wire on which the filament is bent, in short lengths.

Vapor Light. A still later invention in electric lighting is the vapor lamp, which consists of a long glass tube from which the air has been exhausted, with a metal wire at each end. These wires conduct the current to the electrodes, one of which is mercury. The lamp is started by tilting the tube so that the mercury flows from one electrode to the other in a small stream. This makes connection between the electrodes, and when the stream of mercury breaks an electric arc is formed. The heat from this arc vaporizes the mercury, and this vapor becomes luminous. Since there is no opportunity for the vapor to escape, the mercury is used over and over and the lamp will operate as long as the vacuum remains perfect. The vapor lamp produces a brilliant white light, which radiates evenly in all directions. It is particularly valuable for lighting large areas, such as factories, docks and other places where a strong light is required.

The Source of Light. An electric lighting plant consists of the central station, where dynamos, usually operated by steam engines, generate the current; the main lines, which conduct this current to the various parts of the city, and the individual lines, over which the current is taken to supply light where it is needed. Where these individual lines connect with the main lines, the potential of the current is reduced by causing it to pass through transformers.

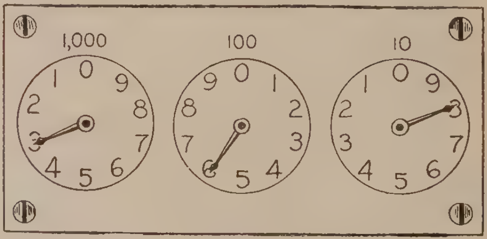
ELECTRIC LOCOMOTIVE. See LOCOMOTIVE, subhead *Electric Locomotive.*

ELECTRIC MACHINE, any machine for producing powerful electrical effects. The name is, however, seldom applied to machines depending on magneto-electric principles, but is practically confined to two classes of machines—those which act by friction and those which act by electro-static induction. The former are called *friction machines* and the latter *influence machines.* For many years the former were the only kind known, but they have now been almost superseded by the latter. In friction machines, the electricity is generated by the friction of either a glass cylinder or a circular glass plate against cushions covered with an amalgam of zinc and tin. The positive electricity, which is thus developed on the surface of the glass, is given off to an insulated brass conductor, furnished with teeth like those of a comb, the sharp points of which are nearly in contact with the glass. The negative electricity, which is at the same time generated on the cushion, must be provided with some means of escaping, or the action of the machine would soon stop. It is usually allowed to escape to the earth by a brass chain, connected with the cushions; but in some machines a negative conductor, connected with the cushions, is insulated, like the positive conductor, by a glass support. Negative sparks can then be drawn from this conductor at the same time that positive sparks are drawn from the other. Friction machines have been almost entirely replaced by influence machines, and descriptions of these are found in ordinary textbooks on physics.



ELECTRIC MACHINE

ELECTRIC METER, an instrument for measuring and recording the amount of electricity used in electric lighting or by an electric motor. The meter in general use is a sort of electric motor, whose armature revolves in a horizontal direction. The axis of the armature is connected with a system of clockwork, which moves an indicator over dials that are graduated decimally. The speed with which the armature revolves depends upon the quantity of current passing through the meter. The unit of measure is the watt, that is, a current of one ampere, with a pressure of one volt, flowing for one hour. This unit is called a *kilowatt-hour.*



A SMALL ELECTRIC METER

How to Read a Meter. A meter may have three or more dials, representing 10, 100, 1,000, 10,000, 100,000 or more kilowatt-hours. Each dial has a pointer which is moved by the interior mechanism. The pointer at the right moves from the position of 0 toward the right; the wheels which set it in motion connect with the mechanism of the dial to the left, whose pointer necessarily moves in the opposite direction. The connection continues to the other dials, in the same manner. The illustration explains on its face the method of determining the quantity of current used; the dials indicate 3,580.

ELECTRIC MO′TOR, a device for driving machinery by the power of an electric current. The electric motor is constructed on the same plan as the dynamo (which see). If a dynamo be supplied with a current of electricity from an outside source, it will run as a motor. The principle of the machine is the inducing of magnetism by an electric current. The current induces magnetism in the armature and the field magnet, and the reversed position of the poles in these magnets causes the armature to revolve. The revolution produces another reversal, and so the motion is continued. As long as the current is constant and the resistance even, the motor revolves at a uniform rate of speed.

While electric motors and dynamos are in principle interchangeable, in practice each machine is constructed for the work it is to perform. Dynamos are much larger than motors, and the same dynamo may furnish power for a number of motors, as a dynamo of 100 horse-power may supply power to twenty motors of five horse-power each, or two motors of fifty horse-power each, and each of these may be located far from the others and from the dynamo.

The great advantage in the use of the electric motor is derived from the ease with which electric power can be carried a long distance and distributed with comparatively little loss. In a large factory the placing of electric motors at frequent intervals does away with the long lines of shafting, with their accompanying belts and pulleys, which are necessary when such a motive power as a steam engine or water wheel is employed. The electric motor also makes it possible to utilize water power for generating the current, often hundreds of miles from the place where the motors are located. Because of these advantages electric motors are rapidly taking the place of large engines in factories. Many machines are now constructed with an electric motor attached. In such cases all that is necessary to operate the machine is to turn on the current. By the use of such a device, waste of power is eliminated, as the instant the work is completed the power can be shut off. The electric motor does not require a skilled operator, and with necessary attention to oiling and cleaning, it will usually run for years without repair.

ELECTRIC RAILWAY, a railway on which electricity is used as the motive power. It was the invention of the dynamo (which see) that made such railways practicable, but the idea had been discussed many years previously. At an industrial exposition in Berlin in 1879 a circular railway about a thousand feet long was exhibited, showing that the proposition of propelling cars by electricity was not fantastic. The first electric railway in the United States was constructed by Thomas A. Edison at Menlo Park, N. J., in 1880. The track was about ninety rods in length. Three years later Stephen D. Field of California exhibited an electric locomotive at an exposition of railway appliances in Chicago. The first suburban electric line in the United States was constructed from Baltimore to Hampden, Md., and put in operation September 1, 1885. Three years later the street railways of Richmond, Va., were equipped with electric motors, and from that time to the present the expansion of the electric railway has continued, until it is found in all large cities and in many small cities and towns. Indeed, many electric lines have been constructed between cities and towns distant from one another.

The motor apparatus of an electric railway consists of a central station, where a dynamo operated by steam or water power generates the electric current. This is distributed along the line through overhead wires, which are insulated from surrounding objects. On single track roads but one overhead wire is used, except at the switches, where two are always necessary. From the wire the current is drawn by the *trolley*, a small grooved wheel running on the trolley wire and attached to the end of a conducting pole that extends upward from the car. The trolley is connected with the motors, which are attached to the trucks of the car by wires extending down the side or end of the car. The motor is controlled by a compound switch, or controller, which is operated by the motorman. After it has been used, the current passes into the trucks of the car and from these to the rails, which are connected by copper wire, so that they return the current to the station from which it started.

This is the plan in most general use for distributing power; but another, used on elevated roads and to some extent on lines which own their right of way through the country, is known as the *third rail* system. In this a third rail, either between the rails of the track or opposite one of them, supported on insulators, carries the current, which is brought in contact with the motor through a shoe that slides over the rail. The third rail is dangerous and cannot be used in places where there is liability that people or animals will come in contact with it. In a few cities, where overhead wires are not permitted, cars receive the current from conductor rails. These are sunk in slots, through which an arm extends from the motors. This is called the *conduit* system.

In 1919 there were over 44,000 miles of electric railways in the United States. Electric locomotives having great power are now in use on the New York, New Haven & Hartford Railroad for hauling both passenger and freight trains. They are also employed for hauling trains through the tunnels through which the New York Central and the Pennsylvania systems enter New York City; by the Grand Trunk in the Saint Clair Tunnel; by the Great Northern in the Cascade Tunnel and by the Baltimore & Ohio in entering Baltimore and by the Chicago, Milwaukee & Saint Paul in Montana. See LOCOMOTIVE, subhead *Electric Locomotive*.

The development of the electric railway since 1900 has been very rapid, not only in the extension of the lines but also in the improvement of motors and cars. Electric lines now maintain a speed nearly equal to that of the best steam railways, and electric sleeping cars and dining cars are provided for travel between distant points. The great advantage of the electric railway lies in the reduction in expense of operating, and also in the fact that lines can be extended where it is either impracticable, because of expense, or impossible, because of grades, to construct railways operated by steam power.

ELECTRIC WELDING. See WELDING.

ELECTRO-CHEMISTRY, a branch of science which investigates the relation of electricity to chemical changes. In electric cells in any of their various forms, chemical changes produce electricity; in electrolysis, on the contrary, electricity produces chemical changes. Electro-chemistry is of first importance in a great range of manufacturing interests. See ELECTROLYSIS.

Electro-chemistry is very generally employed in the manufacture of soda and chlorine from salt, potassium chlorate from potassium chloride, carborundum (see CARBORUNDUM) and carborundum aluminum and other substances requiring the action of intense heat. This heat not only smelts the ore containing the required substance, but also causes certain chemical changes to take place, so as to set the product free. The operations of electro chemistry most commonly seen are those of electroplating and electrotyping. See ELECTROTYPING.

ELECTROCUTION, *e lek tro ku'shun,* a method of inflicting the death penalty by electricity, as punishment for first-degree murder. The person to suffer death by this means is strapped to a chair; one electrode is fastened to the top of his head, the other to an ankle. A current of about 2,000 volts is then applied, and it passes through the body. This method is used exclusively in criminal executions in several states of the United States, having been adopted on the recommendation of a board of investigators, for the reason that it is more humane than hanging. See CAPITAL PUNISHMENT.

ELEC'TRODE, the term used to denote the terminals by which electricity enters or leaves a body upon which it acts. They are the same as *poles*. The positive electrode is known as the *anode,* and the negative is called the *cathode*. These terms were originally introduced by Faraday and were used only in connection with electrolysis, but they are now in general use wherever electricity is applied.

ELECTROL'YSIS, the chemical decomposition of certain bodies, under the action of a current of electricity. The following are the main facts to be mentioned. When an *electrolyte* (a body capable of electrolytic decomposition, such as iron), is subjected to a current of electricity of sufficient intensity, it is broken up into elements.

It is known that the electric currents which pass through the ground from trolley lines to power houses—in fact, any other strong currents on the soil—tend to eat away the metal pipes which carry water, gas or sewage. Sometimes the decay is so serious that the pipes break and the gas or water escapes, to do great damage. Trouble that has resulted in suits between water and gas companies and railway companies has arisen in many cities. The remedy is one of prevention and consists in providing suitable lines for carrying return currents of electricity.

ELECTRO-MAGNET, a piece of iron temporarily converted into a magnet by means of a current of electricity sent through a wire coiled round the iron. The wire is usually covered with silk, cotton, gutta-percha or some other insulator, to prevent the current from leaping across and to compel it to travel through the whole length of the wire. The more pure and soft the iron is, the stronger will its magnetism be while it lasts, and the more completely will it disappear when the current stops. Steel is less affected than soft iron for the time, but remains permanently magnetized after the current ceases. The iron which is magnetized by the current passing round it is called the *core*. It is frequently straight, the wire being wound upon it like thread upon a reel; but very frequently it has the shape of a U, or horseshoe, the wire being coiled round the two ends and the bend of the U left uncovered.

To predict which end will be the north pole, the following rule may be employed: Let the core be a straight bar of iron held in front of you pointing left and right; then if the current ascends on the side next you and descends on the further side, the north pole is to your left hand, the south pole to your right. If the straight bar is then bent into horseshoe shape, its poles will not be changed.

An electro-magnet is said to be *made* when the current is sent through its coil, and *unmade* when the current is stopped. In some applications of electro-magnets it is necessary to make and unmake them in rapid succession. It is then preferable for the core to consist of a bundle of iron wires, rather than of a solid bar.

Electro-magnets make possible the telegraph, telephone, electric light and all electric power. In iron and steel manufacturing plants great magnets, supported on elevated tracks, are able to pick up and carry from one part of a building to another masses of iron weighing several tons. See DYNAMO; TELEGRAPH; TELEPHONE.

ELECTRO-MAGNETIC THEORY OF LIGHT, a theory that light is caused by electro-magnetism (see ELECTRO-MAGNETISM). The theory holds that light and electricity come from the same source, and the discovery of the Roentgen rays, which have several characteristics of the electric current, tends to confirm the theory.

The electro-magnetic theory of light and the electron theory of electricity confirm each other and offer the best explanation of the facts so far known regarding light and electricity. See ELECTRICITY, subhead *The Electron Theory.*

ELEC'TRO-MAG'NETISM, a term that in its broadest sense denotes the science which treats of the relation between magnetism and electricity. In a narrower sense, a magnetic effect produced by electricity is said to be *electro-magnetic.*

The simplest experiment to illustrate this action is to take an ordinary surveyor's compass, hold just above it a copper wire parallel to the needle of the compass and then, while the wire is in this position, let its two ends be connected with the two poles of a galvanic battery. The needle will instantly turn away from its north and south position and will remain deflected as long as the current continues to pass over it. If the current flows from south to north, the north end of the needle is turned to the west; if the current is in the opposite direction, the needle turns to the east. This is the easiest test for determining the direction in which a current is flowing through a wire; and it is the basis of the construction of galvanometers, the instruments employed for the measurement of currents (see GALVANOMETER). The current tends to make the needle take a position at right angles to the direction of the current; but as the earth tends to make the needle point north and south, the position actually taken is between the two. The fact that a current deflects a needle was discovered by Oersted of Copenhagen, in 1819.

When a magnet is moved in the neighborhood of a wire or other conductor, the motion causes a current of electricity in the conductor; and a similar effect occurs if the wire is moved while the magnet remains at rest. In the experiment above described, of making a magnetic needle turn on its pivot by sending a current through a wire held above it, the motion of the needle produces for the time being a weakening of the current. If the needle were made by mechanical means to turn the contrary way, it would strengthen the current for the time being. If there were no original current, the turning of the needle to either side by mechanical means would produce a current in the wire. The current thus produced is always opposite in direction to that which would aid the motion. The principles of electro-magnetism are employed in the construction of electric motors.

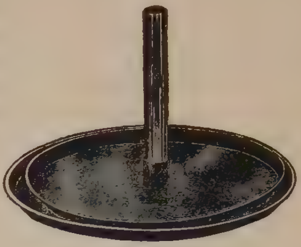
ELECTROM′ETER, an instrument used to measure the difference of potential between two conductors. Most of the electrometers in use are inventions of Sir William Thomson, who was the first to give accuracy to this branch of electrical measurement. His quadrant-electrometer is the one most used. As it is employed only in laboratory work, it is of little interest to the general public.

ELEC′TRO-MO′TIVE FORCE, a phrase, commonly abbreviated into the three letters e. m. f., is the force which tends to cause a flow of electricity. The electro-motive force in a wire through which a current is flowing may be compared to the difference of pressures in a long, narrow horizontal pipe, through which water is flowing. As the difference of the pressure at the two ends of the pipe forces the water through, in spite of frictional resistance, so the difference of the potentials at the two ends of the wire forces the current through, in spite of the electrical resistance of the wire. This difference of potentials is another name for electro-motive force.

The commercial unit of electro-motive force is the *volt*. Its magnitude may be inferred from the statement that the electro-motive force of a single cell of an electric battery is usually more than one volt and less than two and one-half volts. The electro-motive force of the ordinary circuit for electric lighting for homes is from 110 to 120 volts. It is no unusual thing for a dynamo to give an electro-motive force of 1,000 or 2,000 volts. The number of volts required to kill a man by electrocution varies from 1,200 to 2,500 volts.

ELECTRON. See ELECTRICITY, subhead *The Electron Theory.*

ELECTROPHORUS, *e lek trof′or us,* a simple machine for generating static electricity, that is electricity produced by friction. It consists of a glass plate, fastened to a board, and a metallic disk, either of brass or tin, to which is attached a handle of glass or hard rubber. To generate electricity by this machine, rub the glass with silk, then place the metallic plate upon it and touch the upper surface of this plate with the finger. On lifting the metallic plate by the handle, it will be found to be negatively electrified and may be discharged by a spark. The glass becomes positively electrified when rubbed with the silk, and when the metallic disk is placed upon it, it is electrified by induction. See ELECTRICITY.


ELECTROPHORUS

ELECTROPLATING, *e lek′tro playt ing,* the process by which a thin but solid and durable deposit or plating of gold, silver, nickel, or other metal is put on a cheaper metal by means of an electric current.

The article to be plated is placed in a bath or solution of the desired metal, and through the solution an electric current is passed. The solution is decomposed—broken into its elements—by the action of the electricity (see ELECTROLYSIS), and fine particles of the metal are deposited upon the article to be plated. The thickness of the plate will depend upon the length of time the article remains in the bath.

A medal is made by preparing a cast or mold of the object in some cheap metal and immersing it in the solution, in the same manner as applies to the plating of knives, forks, spoons, watch cases, rings and various articles of adornment. One of the most practical examples of electroplating is called electrotyping, by which pages of type faces and engravings are reproduced in thin copper shells; these are mounted type high on lead or wood bases for printing. See ELECTROTYPING.

ELECTROSCOPE, *e lek′tro skope,* an instrument for ascertaining the presence and nature of a charge of electricity. When a strip of gold leaf, folded in the middle, is suspended in a bottle or a jar by a wire that can be connected with the electrified body, an electroscope is formed. A more simple electroscope, but one less sensitive, is made by attaching a pith ball to a silk thread and suspending it from a glass support. When an object charged with positive electricity is brought near the ball it will be attracted to the object, become charged with positive electricity, and then be repelled, in accordance with the law that like charges repel each other. See ELECTRICITY.

ELECTROTHER′APY, the treatment of disease by means of electrical appliances. In reconstruction hospitals electrotherapy is extensively used in the treatment of wounded and invalid soldiers. The principal methods used are the following:

1. *Galvanism,* or the application of a battery current directly to the body. Such a current acts by electrolysis on the fluids of the body. Oxygen collects at the positive pole, forming acid compounds which tend to harden the tissues and reduce inflammation. Alkali compounds form at the negative pole, increasing the flow of blood to the part and producing greater sensitiveness. Thus the positive and negative poles produce opposite effects.

2. *Faradism,* or the application of a current from the secondary winding of an induction coil. Such a current acts as a sedative.

3. The *sinusoidal current,* a form of alternating current of low frequency.

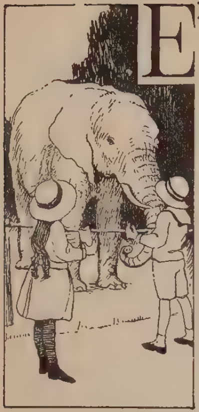
4. *High frequency currents.* Blood pressure may be reduced or increased by high frequency currents. The d'Arsonval current reduces blood pressure. The current is relatively high, and the alterations are extremely rapid, but the voltage or pressure is low. The Tesla current produced at high voltage and high frequency but with relatively low current strength increases blood pressure. One form of Tesla current can be used to heat the interior of the body without appreciably heating the surface. This method of treatment is called "dia-thermy," which means heating through. In treatment with high frequency currents a vacuum electrode is used to explore the electric field about the patient. The tube glows with a violet light when placed in the electric field.

ELEC′TROTYPING, the process of making a metallic cast of type or an engraving by electricity. The form of type or woodcut is cleansed and dusted with finely powdered graphite. It is then laid face upward on a powerful press, a sheet of beeswax upon a lead plate is placed on top of the form and an impression is taken in the press. The wax mold so formed is coated with powdered graphite to make it a conductor of electricity. After the loose particles of lead are blown off, the wax mold is washed with a weak solution of sulphate of copper; then it is dusted with iron filings. It is then suspended in a bath consisting of two parts of sulphate of copper and one part of sulphuric acid diluted somewhat in water. The wax plate is then connected with the negative pole of a battery, and a sheet of copper is hung in front of the wax and connected with the positive pole. The current is then turned on, and the copper is drawn from the plate and deposited upon the wax mold. After several hours the mold is removed from the bath, and the shell of copper is taken from the wax. It is then *backed up* with lead or type metal and planed smooth, when cold; the edges are then finished and the plate is ready for the press. The plate, when complete, is about one-eighth of an inch thick. It is then placed on a block or a frame to make it the same height as the type. Electrotypes are used in book and magazine printing and in the reproduction of engravings and halftones. These books are printed from electrotypes.

A well-made electrotype has been known to remain in fair condition after a single run of 300,000 impressions on the printing press. When small editions of books are run and electrotypes must therefore be handled frequently in reprintings, an electrotype will usually be in poor condition after 125,000 or 130,000 impressions. See HALFTONE; PRINTING.

ELEGY, *el′e ji,* in its widest sense, a serious poem with a melancholy tone. In English poetry the elegy is a lament over the death of a loved one, as Shelley's *Adonais;* or a poem inspired by thoughts of death, as Gray's *Elegy Written in a Country Churchyard.* The *pastoral* elegy, such as Milton's *Lycidas,* is so called from its rural setting. Among the famous elegies not already mentioned are Wordsworth's *Bereavement,* Matthew Arnold's *Thyrsis,* Lowell's *Threnodia, Tennyson's In Memoriam,* and Spenser's *Lament for Astrophel.*

ELEMENTS. See CHEMISTRY, subhead *Chemical Elements.*

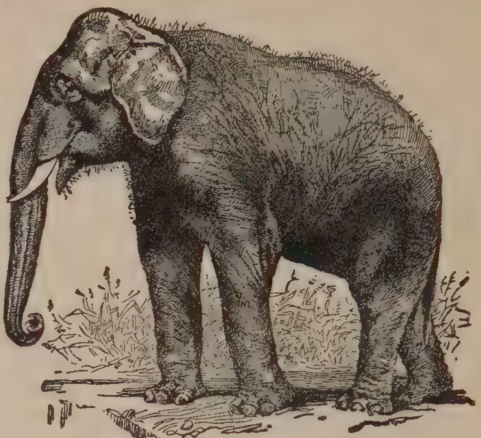


ELEPHANT, *el′e fant,* the largest living land animal, comprising two species, the African and the Asiatic. The African elephant is the larger, stronger and more ferocious of the two, its hide is tougher and its ears larger, its head is less elevated. Its back slopes downward from shoulders to rump. Its trunk is longer and drags on the ground, even when the end of it is curled. Both sexes have tusks. The Asiatic, or Indian, elephant, as it is often called, is smaller. Its back is decidedly rounding, and only the males bear tusks. It is this elephant which is seen at circuses, for unlike the African elephant, it is tame in captivity.

Sometimes elephants attain the height of fifteen feet, but usually a mature animal is from nine to ten feet high and weighs from 4,000 to 10,000 pounds. The body is very bulky, the legs are enormously large and almost straight and the short toes are covered by hooflike nails. The skin of the elephant is very thick and coarse, and it bears only here and there a few scattered hairs.

The most remarkable feature of the elephant is its long trunk, an extension of the nose. It has two tubes extending to the tip. This tip is exceedingly sensitive, and in one species it is furnished with two small projections; one, which somewhat resembles a finger, extends from the upper surface, the other projects from the lower side. By means of it the animal can pick up very small objects. The trunk is provided with very strong muscles and is useful in procuring food and for defense. With his trunk the elephant picks up and puts into his mouth all his food and water; with it makes a loud trumpeting noise, his signal of alarm or anger.

The cutting teeth on each side of the upper jaw develop into long tusks, useful to the animal in a natural state both for grubbing food and for defending itself against attack. In some well-grown males each tusk weighs as much as 200 pounds. Although the head of the elephant is enormously large, and its forehead broad, yet its brain is small. However, this does not show any lack of intelligence, for no animal, with the possible exception of the horse and dog, can be taught to do more things requiring intelligence than the elephant.



AFRICAN ELEPHANT

Elephants live in herds of considerable size, but the old males sometimes leave the herds or are driven from them, and thereafter live solitary lives. They usually become vicious and exceedingly destructive sometimes demolishing native crops. Such elephants are commonly called rogues. The wild animals are caught in various ways. Sometimes pits are dug, into which the animals fall; or, a strong enclosure is built, into which the elephants are driven by fires, gun shots or other loud noises. In some localities trained elephants are sent out into the forests to make the acquaintance of wild ones and lead them into captivity. Two tame elephants can keep a single wild one so interested that the hunters are able to come up and put heavy chains about its legs and tie it to a tree, where it is held during the furious anger which follows its capture. After a long and tedious struggle, the captured elephant is subdued and then becomes tame and submissive.

Elephants have been known since very early times. The earliest records in history tell us that they were trained by man to do various things even to take part in war. Hannibal had with him an army of elephants when he invaded Italy, and much of his success was due to the terror they inspired.

The animals have been used to a greater extent in India than in any other country. There they have been for centuries a chief means of conveyance, carrying passengers in commodious canopied seats on their backs.

Two or more persons may occupy this seat; the driver sits on the animal's neck. Elephants can be taught to do numerous kinds of work, to lift great weights and to carry heavy loads.

Many elephants are held in captivity, altogether for show purposes. There is hardly a zoölogical garden in existence that does not have one or more of these animals. They are always great favorites with the children and learn to expect food and little attentions from every child that comes their way. Some of the herds that are exhibited by circuses and traveling shows are trained to do remarkable tricks.

ELEPHANTIASIS, *el e fan ti′a sis,* a disease prevalent in the East Indies and other warm countries. One attack of the disease is followed by others, and after each attack some part of the body, usually the leg, becomes larger and larger, till it grows to enormous size. The disease is sometimes called *Barbados leg;* the more common name refers to the fact that the skin of a victim becomes rough, something like an elephant's hide. Attacks are brought on by a tiny worm which works under the skin. It is thought to be transmitted by the mosquito.

ELEPHANT SEAL, the largest of the seal family. There are probably two species, one found only on the coast of California and western Mexico, the other in Patagonia, Heard's Island and some waters of the southern hemisphere. The animals vary in length from twelve to thirty feet, and are about twelve feet in circumference. They have heavy tusks, prominent eyes and eyebrows and an elongated nose, or snout. Both species are hunted and are consequently becoming very rare. See SEAL.

ELEUSINIAN, *el u sin′e an,* **MYSTERIES,** the sacred rites observed in ancient Greece at the annual festival of December, or Ceres, so named from their original seat, Eleusis. They constituted a kind of miracle play, which represented the scenes Demeter passed through in searching for her daughter Persephone. The candidates for the acting rôles were expected to walk from Athens to the sea for purification in the salt water; to fast a day, to offer sacrifices, and to rehearse in processions. On the ninth day of their initiation they were conducted to the lighted shrine in the temple, where the mysteries were revealed to them. As a preparation for the greater mysteries celebrated at Athens and Eleusis, lesser Eleusinia were celebrated at Agrae, on the Ilissus.

ELEVATED RAILWAY, a railway built upon framework above the level of the street. New York, Boston and Chicago are the only cities in the United States having elevated roads, although Philadelphia is to have such a line. A framework of steel is used, supported by steel pillars. Between these are stretched cross beams, upon which plate girders are laid. The entire structure is thoroughly braced. Ties are laid on the top of the girders, and to these the rails are spiked. The stations are erected on elevated platforms, of the same height as the track, and are reached by stairways or elevators. In Boston and New York the elevated roads connect with subway lines. The first elevated railway in America was built in New York City in 1867. Berlin, Paris and Liverpool are European cities with elevated railways. At first steam was used for the motive power, but that has now been almost entirely replaced by electricity. On a few of the German elevated railroads the cars are suspended beneath the girders. These lines are known as *suspended railways.*

EL′EVATOR, a mechanical contrivance for hoisting loads from one level to another. That used for carrying grain or coal out of ships, or for similar purposes, consists of a series of boxes, or buckets, attached to a belt traveling round two drums, placed one above the other. The elevator used for raising loads from one story of a building to another consists of a movable cage, balanced with weights and operated by steam or electric power. The development of this kind of elevator was epoch-making in its effects upon architecture, making possible the modern skyscraper. A *grain elevator* is a large building for storing grain. See GRAIN ELEVATOR.

ELGAR, EDWARD WILLIAM, Sir, (1857–), the greatest of present-day British composers, born at Broadheath, near Worcester. He was thoroughly educated in music and specialized on the violin and organ. In 1882 he became conductor of the Worcester Instrumental Society, and three years later was organist at Saint George's Church. He resigned this post in 1889 and began to devote himself to composition. He was knighted in 1904 and the following year became professor of music in the University of Birmingham, where he remained until 1908. Elgar's compositions include works in all forms, including operas, symphonies, oratorios and concertos. His *Dream of Gerontius,* an oratorio, is among the few inspired large works of English composers.

ELGIN, *el'jin,* ILL., in Kane County, thirty-seven miles northwest of Chicago, on the Fox River, and on the Chicago & North Western and the Chicago, Milwaukee & Saint Paul railroads, and the Chicago, Elgin and Aurora electric line. It is in an agricultural region, and dairying is particularly important among the industries. Elgin butter is quoted on all produce exchanges. An important religious publishing house is located here. The manufactures includes silverplate, condensed milk, shoes, flour and machinery; the famous Elgin watches are made here, and there is also an important watch-case factory, one of the largest in the United States. The educational institutions are the Elgin Academy, a Roman Catholic Seminary and a manual training school; the city also contains the Northern Illinois Hospital for the Insane and Gail Borden Public Library. Elgin was settled in 1835 and was chartered as a city in 1854. Population 1910, 25,976; in 1920, 27,431.

ELGIN, JAMES BRUCE, Eighth Earl of (1811–1863), English statesman, son-in-law of the Earl of Durham, was educated at Eton and at Christ Church, Oxford. After four years as governor of Jamaica he was appointed Governor-General of Canada in 1846, while the struggle for responsible government was at its height. Though the principle had been acknowledged by Lord Sydenham in 1841, it was not until Lord Elgin summoned Lafontaine and Baldwin to form a new Ministry after the general election of 1848 that the principle was really in operation. Since that date no Canadian governor has ever denied either the principle or practice of responsible government. His frankness and his genial manners were of great aid to him in his efforts toward reform, and long before his term of service was over he was described as the most popular man in Canada. Lord Elgin returned to England in 1854, and in 1862 became Viceroy of India.

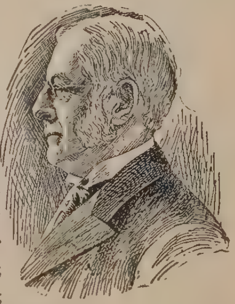
EARL OF ELGIN

ELGIN, *el'gin,* **MARBLES**, one of the world's most famous collections of sculptures, all obtained from Athens. They comprise fifty-six slabs from the celebrated frieze of the Parthenon (which see), the principal figures from the pediments of that structure, and fifteen from its metopes, besides a Caryatid (see CARYATIDES) from the Erechtheum, a portion of the frieze of the temple of Athene Nike, and various inscriptions and fragments. This priceless collection represents a year of labor on the part of the seventh Earl of Elgin (1766-1841), who secured them in 1801, while he was serving as ambassador to Turkey. In 1816 they were purchased from him by the British government for $175,000, and placed in the British Museum. The removal of the sculptures was denounced by some as an act of robbery, but time has justified the deed, for art works which were left in Athens were seriously injured by the Turks.

E'LI, one of the Hebrew judges, the predecessor of Samuel. He was high priest and judge for forty years. The story of Eli is told in these volumes in the article BIBLE, subhead *Bible Stories.*

ELI'JAH, the most distinguished of the prophets of Israel, flourished in the ninth century B. C., during the reigns of Ahab and Ahaziah (*I Kings,* XVII–XXI). His special work seemed to be to pronounce vengeance on the kings of Israel for their apostasy. Elijah ascended to heaven in a chariot of fire, in the presence of Elisha, his successor. See BIBLE, subhead *Bible Stories,* for details of Elijah's career.

ELIOT, CHARLES WILLIAM (1834–), one of the most honored of American educators, was born in Boston. He was educated at Harvard College, and upon graduation was appointed tutor of mathematics in that institution. Later he became assistant in mathematics and chemistry there. After spending seven years teaching at Harvard, he went abroad to study the educational systems and methods of European countries. On his return he was appointed professor of analytical chemistry in the Massachusetts Institute of Technology.


CHARLES W. ELIOT

In 1869 he was chosen president of Harvard University. Under his administration the work of the university was completely reorganized and its scope greatly broadened. He retired in 1909. Doctor Eliot is recognized as one of the leading authorities on higher education in the United States, and he is widely known as a speaker and writer on educational subjects. He is the author of *Compendious Manual of Qualitative Chemical Analysis, The Working of the American Democracy, American Contributions to Civilization and Other Essays, University Administration* and of many essays and addresses. Late in his career he chose the texts for a standard library, which were published as the "Five-foot shelf of books," or "The Harvard Classics." See HARVARD UNIVERSITY.

ELIOT, GEORGE (1819–1880), the pen name of Mary Ann (or, as she preferred to write the name in later years, Marian) Evans, one of the greatest of English novelists. She was the daughter of a Warwickshire land agent and surveyor and was born at Arbury. She received an excellent education and, although obliged by her mother's death to take charge of the home at sixteen, she managed to keep up her studies, so that by the age of twenty-one she had a large, if decidedly unsystematic, fund of knowledge. The removal of her family to Coventry in 1840 led to her acquaintance with a number of freethinkers, under whose influence she became an agnostic. Her first literary work was a translation of Strauss's *Life of Christ*, published in 1846.

GEORGE ELIOT

In 1849, on the death of her father, she went to the Continent and spent some months at Geneva. On her return to England she became assistant editor of the *Westminster Review*, a position which was of great importance to her, because it led to acquaintance with many of the foremost men of the day. Among these was one who was destined to have most influence on her life, George Henry Lewes. Miss Evans and Lewes could not marry, as Lewes had a wife still living, from whom he could not secure a divorce; but they both regarded their union, which lasted until the death of Lewes, as possessed of all the force of a legal marriage. It was through the influence of Lewes that George Eliot made her first attempt at fiction, *The Sad Fortunes of the Reverend Amos Barton*, which appeared in *Blackwood's Magazine* in 1857. This was followed by *Mr. Gilfil's Love Story* and *Janet's Repentance*, and these were afterwards republished as *Scenes of Clerical Life*. The stories were enthusiastically received, and the praise of the unknown writer was increased on the publication of *Adam Bede*. *The Mill on the Floss*, with its portrayal, in Maggie Tulliver, of George Eliot's own youthful personality, and *Silas Marner* followed, and then she turned from her pictures of middle class English farm life to prepare for the writing of a historical novel, the scene of which should be laid in Italy. The result was *Romola*, her most ambitious, if not in all ways her most successful, work. In her remaining novels, *Felix Holt, Middlemarch* and *Daniel Deronda*, her scenes are again laid in England. A long poem, *The Spanish Gypsy*, added little to the fame of its author. Mr. Lewes died in 1878, and George Eliot, although her grief was extreme, was married in 1880 to John Walter Cross. She lived only six months after her marriage.

ELIOT, JOHN (1604–1690), "the apostle to the Indians," was born in England and graduated at Cambridge University. In 1631 he removed to Boston and the following year connected himself with a church at Roxbury, Mass., and kept up the connection until a short time before his death. He learned the language of the Indians and devoted himself to improving their condition. He translated the Bible into the Indian tongue, published an Indian grammar and with others made the *Bay Psalm Book*, an English metrical version of the Psalms, the first book printed in New England. At South Natick and at Newton are monuments to Eliot's memory.

ELI'SHA, a Hebrew prophet, the disciple and successor of Elijah (*II Kings*, II, IX, XIII, XXI). Many miracles of prediction and cure, and even of raising the dead, are ascribed to him, but his figure is less original and heroic than that of his master. He held the office of prophet for fully sixty-five years, from the reign of Ahab to that of Joash.

ELIX'IR, a word of Arabic origin, applied to a number of solutions employed by alchemists in an attempt to change base metals into gold; also, a potion, the *elixir vitae,* or elixir of life, supposed to confer immortality. Elixir is still used as a name for various patent medicines.

QUEEN ELIZABETH

ELIZ'ABETH, (1533–1603), queen of England, daughter of Henry VIII and Anne Boleyn, was born at Greenwich and was almost immediately declared heiress to the crown. After her mother was beheaded (1536), Elizabeth was declared illegitimate, but she was finally placed after Edward and Mary in the order of succession. At the death of Edward, Elizabeth vigorously supported the title of Mary against the pretensions of Lady Jane Grey, but nevertheless continued throughout Mary's reign to be an object of suspicion.

In self-defense she made every demonstration of zealous adherence to the Roman Catholic faith, but her motives were well known. In 1558 Mary's reign came to a close, and Elizabeth was immediately recognized as queen by Parliament. Following the bloody reign of Mary, stained with religious persecutions, naturally the first great object of Elizabeth's reign was to settle the religious question. She called Parliament on January 25. The nation was prepared for a return to the reformed faith, and the ecclesiastical system devised in her father's reign was reëstablished, the royal supremacy was reasserted and the revised prayer book was enforced by the Act of Uniformity. Elizabeth's first Parliament approached her on a subject which, next to religion, was the chief vexation of her reign—the succession to the crown. They requested her to marry, but she declared she would never marry.

For the most part Elizabeth and her ministers were on the side of peace, and they undertook no wars which were not absolutely necessary. Some support was given to the Huguenot party in France and to the Protestants in the Netherlands, so that throughout Europe Elizabeth was looked on as the head of the Protestant party. But her parsimony was too great ever to allow her to furnish substantial aid. Many of the political events of the reign were connected with Mary Queen of Scots (See MARY STUART). The detention of Mary in England, whither she fled to the protection of Elizabeth, led to a series of conspiracies, beginning with that under the earls of Northumberland and Westmoreland and ending with the plot of Babington, which finally determined Elizabeth to make away with her captive. The state of France, consequent on the accession of Henry IV, who had been assisted by Elizabeth, obviated any danger from the indignation which the deed caused in that country; and the awe in which King James stood of Elizabeth, and his dread of interfering with his own right of succession to England, made him powerless. But Philip II of Spain was not to be appeased. The execution of Mary lent edge to other grievances, and he refused to be satisfied with the sacrifice Elizabeth seemed prepared to make of her Dutch allies. He dispatched against England the great Armada, which furnished occasion for a tremendous English victory, redounding to the glory of Elizabeth and her ministers (See ARMADA).

In her choice of advisers Elizabeth showed remarkable sagacity, and her government at home and abroad was sustained by such men as Burleigh, Bacon and Walsingham. In her choice of personal favorites, notably Dudley, Earl of Leicester, and the Earl of Essex, she was not so fortunate. Elizabeth's reign was one of the most brilliant in history. Not only in the department of state, but in all ranks, were men of more than local or periodic eminence, among them Spenser, Shakespeare and Bacon. It was in Elizabeth's day that the East India Company was founded, and the way thus paved for the beginning of England's colonial empire.

ELIZABETH, N. J., the county seat of Union County, on Staten Island Sound, four miles southeast of Newark and twelve miles southwest of New York City, on the New Jersey Central, the Pennsylvania and the Lehigh Valley railroads. It is an important suburb of New York City. The industries comprise the manufacture of sewing machines, paints, hardware and tools, besides iron founding and shipbuilding. The city takes a leading place in the shipment of coal and iron. The town was first settled in 1609 by Dutch and English in the employ of the East India Company, and it became a city in 1855. Population, 1910, 73,409; in 1920, 95,682, a gain of 30 per cent.

ELIZABETH CITY, N. C., the county seat of Pasquotank County, forty-six miles south of Norfolk, Va., on the Pasquotank River and on the Norfolk & Southern and the Virginia & Carolina Coast railroads. It is in an agricultural, lumbering and cotton region, has a good harbor and a considerable trade. Oyster cultivation is the principal occupation, and there are also shipyards and cotton, flour and planing mills. The city is the home of a state normal school. The place was settled in 1793. Population, 1910, 8,412; in 1920, 8,925 (Federal census).

ELK, a name applied to two members of the deer family, found respectively in the European and North American continents. Both species have been hunted until their numbers have been greatly reduced.

American Elk, or **Wapiti** (Indian name). This noble game animal once ranged over the continent from the Carolinas to Alaska, but it is now seen only in the Rocky Mountains from the Northern United States into Alberta. It has been hunted for its flesh, hide, teeth and antlers, especially by the Indians. They covered their tepees and lodges with the wapiti's skin, and used the flesh for food. Later, after the whites gained possession of the West, large numbers of the animals were slaughtered for their teeth, which were used by the Elks' fraternal order as membership badges. Game laws are now in force to protect surviving wapiti, and the membership badges of the order are an imitation elk's head.

AMERICAN ELK, OR WAPITI

The American elk is a close relative of the European red deer, but is much larger, standing five feet high at the shoulder, and weighing as much as 1,000 pounds. Its upper parts are yellowish-brown, and its sides are gray; there is a whitish patch on each buttock, and the red and black neck has a thick growth of coarse black hair. The animal has a magnificent pair of branching antlers, which curve outward and backward, but have the tines pointing forward. Grasses, weed and leaves form the wapiti's food.

European Elk. This, the largest deer of Europe, is very similar to the moose of the United States. It stands about six feet in height at the shoulders, has a thick, large, clumsy head and broad, flat horns. It is grayish-brown in color, some parts being lighter than others. It is still found in many of the wilder parts of Europe, as it is rigidly protected by law. It is easily tamed and has been used as a beast of burden in Sweden.

The Irish elk was a large animal which is now extinct. It was distinguished by its enormous antlers, the tips of which were sometimes as much as eleven feet apart. Its remains are found not only in Ireland but in Scotland and England and on the Continent.

ELKHART, IND., in Elkhart County, 100 miles east of Chicago, at the junction of the Saint Joseph and the Elkhart rivers, and on the Lake Shore & Michigan Southern (New York Central Lines), the Big Four and the Saint Joseph Valley railroads. The rivers furnish water power, and the city contains railroad shops, brass and iron works and manufactories of carriages, bicycles, automobiles, musical instruments, starch and paper. The city has a Carnegie Library. Population, 1910, 19,282; in 1920, 24,277.

ELKS, BENEVOLENT AND PROTECTIVE ORDER OF, a fraternal society organized in New York City in 1868. In 1871 the Grand Lodge was incorporated, and the past officers of New York Lodge Number 1 were made its charter members. The Grand Lodge was empowered to form subordinate lodges, and since then organizations to the number of over 1,300 have been established in various cities of the United States and in its outlying possessions. White male citizens of the United States twenty-one years of age and above are eligible to become members. Only one lodge can be organized in a city, and no city with less than 5,000 population can possess such a society. Relief is extended to members of the order, and to sufferers in such disasters as the California earthquake. Altogether, a sum between $3,000,000 and $4,000,000 has been expended for charitable purposes. An annual memorial service for the deceased members of the order is held on the first Sunday of December. The official organ is a monthly issued in New York—the *Elks Antler.*

ELLESMERE, *elz′meer,* **LAND,** the name given to a part of Arctic America. It is separated from Greenland by Smith Sound and is south of Arthur and Grinnell Lands. Snow and ice are perpetual over almost the entire tract.

ELLIOTT, Maxine (1871–), an American actress, born at Rockland, Maine. She accomplished her first stage success at the age of nineteen, with E. S. Willard in *The Middleman.* In 1895 she went with Daly's company to London, where she played in light comedy and in Shakespearean parts. Later she joined Nat C. Goodwin, to whom she was married in 1898 and from whom she was later divorced. Plays in which she has appeared with more than ordinary success are *The Professor's Love Story, Nathan Hale, When We Were Twenty-One* and *Her Own Way.* Since 1903 she has been owner and manager of the Maxine Elliott Theater, New York City, and has been an independent star. Among her more recent successes are *Her Great Match* and *Myself—Bettina.*

ELLIPSE′, a figure in geometry ranking next in importance to the circle, produced when a cone is cut by a plane passing through it neither parallel to, nor cutting, the base. It may also be defined as the path of a point moving in a plane in such a way that the sum of its distances from two fixed points, called the *foci* (each, a *focus*), is equal to the elliptical path. The area of an ellipse is πab, in which a is half its length, b, half its width, and π, about 3.14159. Kepler discovered that the paths described by the planets in their revolutions round the sun are ellipses, the sun being one of the foci.

ELLIS ISLAND, an immigration receiving station of the United States government. The island is situated in New York Harbor, a mile southwest of Manhattan. All immigrants who enter America by way of the port of New York are detained at Ellis Island, and there are examined as to their physical, mental and moral condition. Those who pass the tests are then landed in New York City and permitted to go to their destination. During the World War few immigrants passed through this "Gateway to the New World," but in the normal years preceding the annual number exceeded a million.

ELLS′WORTH, Ephraim Elmer (1837–1861), an American soldier. At the outbreak of the Civil War he was commissioned colonel of a company of zouaves, which he had organized and which enlisted on the Union side. He tore down a Confederate flag from the roof of a hotel at Alexandria, Va., and while descending from the roof was shot dead by the proprietor, Jackson, who was immediately killed by a soldier. Ellsworth was accounted in the North the first martyr to the Union cause.

ELLSWORTH, Oliver (1745–1807), an American statesman, born in Connecticut. He distinguished himself in state affairs and in the Continental Congress and was an influential member of the convention which drafted the Constitution of the United States. In 1789 he was elected United States senator from Connecticut and was chairman of the committee which organized the Federal judicial system. He was chief justice of the Supreme Court from 1796 to 1799, and later served the nation and his native state in various high offices.

ELM, a group of trees containing many graceful and valuable species, distributed widely in North America and Europe. No more attractive tree grows than the *white* or *American* elm, with its graceful, vaselike form and slender branches. It grows from seventy-five to 125 feet in height, and is a valuable shade tree for city streets and parks. Boston Common possesses over a thousand beautiful elms, and this tree is one of the most picturesque ornaments of New England roadsides. It is a fairly rapid grower, and is found everywhere east of the Rocky Mountains, from Newfoundland to Florida. The wood is a reddish-brown and is hard, strong and durable. It is used in shipbuilding and for flooring, hubs, barrels and saddletrees. Another American species, the *slippery* elm, is a smaller tree with rough, hairy leaves. It is so called because the inner bark contains a sweet, sticky substance, pleasant to the taste. Children like to chew this bark, and it is used also as a remedy for sore throat.

The *English* elm is another delightful tree, though differing considerably from the white elm. It is of stocky build, with a compact crown, and is a favorite nesting tree for the robin redbreast. There are several fine specimens on Boston Common. The historic "Washington Elm" (which see) is a landmark in Cambridge. Under it Washington took command of the colonial army in 1775.

ELM LEAVES AND FRUIT

EL′MAN, Mischa (1892–), a Russian violinist of international fame, one of the foremost of his day. He is admired not only for his mastery of technic, but for his sympathetic interpretations and his genius for producing sweet and powerful tones. Elman was born at Talnoje, and was educated in music at Odessa and at the Imperial Conservatory of Petrograd (then Saint Petersburg). At the Conservatory he studied under Leopold Auer, a famous teacher of violin, and at his first professional concert, in 1904, he was recognized as a violinist of first rank. For several seasons he played in the United States, where he won enthusiastic approval.

ELMIRA, N. Y., county seat of Chemung County, 100 miles southeast of Rochester, on the Chemung River and on the Erie, the Lackawanna, the Pennsylvania and the Lehigh Valley railroads. The city is noted for its manufacturing establishments, chief of which are railroad shops, steel plate works, rolling mills, iron and steel bridge works, knitting mills, boot and shoe factories, table factories, glass works, the largest fire engine factory in the United States, boiler works and tobacco factories. Elmira is the seat of Elmira College, the New York State Reformatory, the Steel Memorial Library and Arnot-Ogden Memorial Hospital. It has also a state armory, a Federal building, several charitable institutions and eight parks. An interesting feature is a monument to Elmira's noted clergyman and author, Thomas K. Beecher. Near the city is a monument to General Sullivan, commemorating his victory over a force of Indians and Tories in the Battle of Newtown at that spot in 1779. Elmira was settled in 1788. It became the county seat in 1836 and was chartered as a city in 1864. Population, 1910, 37,176; in 1920, 45,305.

EL PASO, *el pah′so*, Texas, the county seat of El Paso County, on the Rio Grande River, 645 miles west by south of Dallas. It is a terminus of the Texas & Pacific, the El Paso & Southwestern, the Atchison, Topeka & Santa Fé, the Mexican Central and Mexican Northwestern railroads and an important point on the Southern Pacific. Across the Rio Grande is Juarez, Mexico, a famous rendevous for revolutionists during the recent Mexican civil war, which nearly involved the United States. The two cities are connected by a long, wooden international bridge and an electric car line.

The city is in a cattle country and carries on a large trade. There are smelting works, cigar factories, cement companies, brick plants, railroad shops, brass works, milling and other industries. The State School of Mines is here, and there is a Carnegie Library, a Federal building, a Masonic Temple, a Knights of Columbus Home and a courthouse. The completion of Elephant Butte Dam provides irrigation facilities which make El Paso the center of a great fruit and vegetable region. The town was first settled in 1827 and became a city in 1869. It was long an unimportant village, but has developed rapidly since 1880. Population, 1910, 39,279; in 1920, 77,543 (Federal census). About thirty per cent are Mexicans.

ELWOOD, Ind., in Madison County, forty-five miles northeast of Indianapolis, on the Lake Erie & Western and the Pittsburg, Cincinnati, Chicago & Saint Louis railroads. It is in an agricultural district and exports considerable live stock, grain and farm produce. Natural gas is yet found in the vicinity, but in decreasing quantity; the city once believed the supply to be inexhaustible. The city contains flour mills, brickyards, iron works, a large kitchen-cabinet factory, and it makes lawn mowers and catsup. There is an $80,000 Federal building and a Carnegie Library. Population, 1910, 11,028; in 1920, 10,790.

E'LY, RICHARD THEODORE (1854–), an American political economist, born at Ripley, N. Y. He was educated at Columbia College and at the University of Heidelberg, Germany. From 1885 to 1892 he was professor of political economy at Johns Hopkins University, and in the latter year he was made director of the school of economics and political science at the University of Wisconsin. His writings, though not purely socialistic in tone, disclose views which stamp him as a radical and progressive social reformer. They include *French and German Socialism* and *Outlines of Economics.* In collaboration with other writers he has produced numerous works on political science and economics, the most recent being *The Foundations of National Prosperity, Studies in the Evolution of Industrial Society,* and *Property and Contract in their Relation to the Distribution of Wealth.*

ELYRIA, *e lir'i a,* OHIO, the county seat of Lorain County, seven miles south of Lake Erie, on the Black River and on the Lake Shore & Michigan Southern (New York Central) and the Baltimore & Ohio railroads. There is also an interurban line which runs to Cleveland, twenty-five miles westward. The city is in an agricultural region, and sandstone is quarried. In 1918 there were sixty-three factories, employing 6,000 men and 300 women. The principal products are steel, sheet steel, tubing, bolts, dies, tools, enameled ware, hoisery, electrical goods, motors and chemicals. Population, 1910, 14,825; in 1920, 20,474.

ELYSIUM, *e lizh'e um,* or **ELYSIAN FIELDS**, among the ancient Greeks and Romans, the regions inhabited by the good after death. In Homer, Elysium is identical with the Isles of the Blessed—a place to which the gods carry their favorites while still alive; while in Vergil and the later poets it is that part of the lower world where the souls of the good dwell after death.

EL'ZEVIR, a famous family of Dutch printers, prominent during the sixteenth and seventeenth centuries and the early part of the eighteenth. They printed editions of the classics and of French, German and Italian writers. Their works were distinguished for the elegance of their style, and the Elzevir editions of various works, still on the market to-day are proof of the permanent value of the workmanship. A style of type called *Elzevir,* designed by them, is used in present-day printing.

EMANCIPA'TION PROCLAMA'TION, a state paper issued by President Lincoln, January 1, 1863, by which all slaves in the states or parts of states actually engaged in rebellion and unrepresented in Congress, or not in possession of the Union armies, were declared free. It was justified as a "fit and necessary war measure" and had been contemplated by Lincoln for many months. When, in September, 1862, Lee was checked at the Battle of Antietam, Lincoln issued a preliminary statement announcing his intention of declaring the slaves free on January 1 if the South in the meantime did not return to the Union. The final proclamation did not legally abolish slavery, but abolition was made effective by the Thirteenth Amendment to the Constitution (which see).

EMBALMING, *em bahm'ing,* a process of treating dead bodies for the purpose of preventing early decay. Modern embalming methods date from the early part of the eighteenth century. The process consists essentially in injecting into the arteries and cavities certain preservative fluids, with which the body is also saturated, and of removing discolorations and other disfigurements. Formaldehyde, mercuric chloride, arsenic, zinc chloride and alcohol are some of the chemicals employed in making the fluids. In the United States the exact formulas used are kept secret. Embalming is an art which reached the height of perfection in antiquity, among the Egyptians. They preserved the bodies not only of human beings, but of sacred animals; mummies have been found which resisted decay for forty-five centuries. The exact process employed by the Egyptians is unknown, but the Egyptians excelled modern peoples in the art. See MUMMY.

EMBAR'GO, in international law, an order issued by a government forbidding vessels to leave a specified port or ports. When the vessels of a foreign state are detained, the embargo is said to be *hostile;* when a state detains its own vessels the embargo is called *pacific.* According to the Hague Convention ships in an enemy port at the time war is declared must be given time to depart. The term is also used with reference to the withholding of supplies from export. During the World War some pressure was brought to bear upon the American government to forbid the export of supplies and munitions to the warring nations, but without success. After America entered the war President Wilson by proclamation placed an embargo on the shipment of supplies to countries in the eastern hemisphere. This matter was regulated by the issuance of Federal licenses. Later the United States entered into special agreement with European neutral nations, whereby the embargo was modified to permit the shipment of foodstuffs.

Embargo Act. The embargo policy was first employed in the United States in 1794, in retaliation for hostile acts in restraint of American trade by Great Britain, but it was removed and was not again used until 1807, when the famous Embargo Act was passed, which detained both foreign and domestic vessels engaged in foreign trade. The act had but little effect upon France and England, the two countries at which it was directed, but it caused great hardship to American ship owners and was repealed in 1809, being replaced by the Non-Intercourse Act. This forbade American ships to enter French or British ports. See WAR OF 1812.

EMBASSY, *em′bas si,* the mission of an ambassador. The term also refers to the ambassador's suite, including a secretary of legation, a private secretary and a physician, as well as the minor members of his staff and his private family. Members of an ambassador's official suite enjoy certain privileges and immunities in the place to which they are accredited.

EMBEZ′ZLEMENT, the crime committed by one who makes personal use of property entrusted to him by another. In order to constitute embezzlement, this taking must violate some confidence. Hence, if the user believes himself authorized to appropriate this money, he does not commit embezzlement. Also, the money must come into his possession by reason of his employment. In the case of the appropriation of such funds, the law presumes that the person has embezzled; however, if no criminal intent can be shown, he is released. The offense is a crime in the statutes of all states and provinces and is punishable by imprisonment, usually for a term of years. Embezzlement differs from larceny in that the embezzler uses property which he holds in his possession, while a person guilty of larceny takes money or goods not held by him.

EMBOSS′ING, the art of producing figures in relief upon plain surfaces. Leather, paper and fabrics are embossed by means of presses, furnished with dies of the desired pattern. Embossing of metal may be done by hand, by beating the metal from the under side, in which case the work is called *repoussé.* In architecture or sculpture the figures are said to be *alto-, mezzo-* or *bas-relief,* according to their prominence. In needlework, embossing is done by embroidering over figures which are padded.

EMBROID′ERY, a popular form of needlework, one which develops skill of hand and the artistic sense. In embroidery various patterns are fashioned on silk, cotton, linen, denim or other fabric. The design is usually stamped on the goods in outline, and for convenience the fabric may be stretched over a frame or hoop. There is hardly a home that does not bear evidence of someone's industry in this art. Sofa pillows, dresser scarfs, lunch cloths, table covers and a wide assortment of garments are embellished with embroidery. The art is not difficult for a girl to learn who has a taste for sewing, but it requires patience, neatness and careful attention to detail. Department stores in cities usually have a division of their fancy goods department devoted to this form of needlework. Instruction books and teachers are provided to assist those desiring to learn.

Embroidery is one of the oldest of decorative arts. The ancient Egyptians and Assyrians practiced it to a considerable extent, and from them the Jews, Greeks and Romans learned it. The oldest known embroidery was done in cotton, linen and wool; later, silk came into greater favor. The Chinese and Japanese embroideries are very elaborate, most of the work being done upon silk, with the figures in brilliant colors of silk alone, or combined with gold and silver. Besides silk and gold threads, beads, spangles, pearls and gems are used in the embroidery of the Persians, Turks and Hindus. The so-called Bayeux Tapestry is really an elaborate piece of embroidery. See BAYEUX TAPESTRY.

EMBRYO, *em′bri o,* and **EMBRYOLOGY,** *em bri ol′o ji.* In biology the embryo is the undeveloped organism from which all plant and animal life proceeds. For example, the embryo of a bean plant is the portion enclosed by the seed coats, and is the part that first awakens to activity under certain conditions of warmth and moisture. In case of a bird the embryo is the part inside the egg shell (see EGG) that develops into a nestling. Embryology is the study of the process whereby the embryo develops into a completed organism. The subject is a fascinating one, and presents many problems which scientists cannot as yet solve.

EMERALD, a well-known transparent gem of pure green color, somewhat harder than quartz. It is a variety of beryl. Its color is due to the presence of chromium. In form the stone is either rounded or a six-sided prism. It is one of the softest of the precious stones, but is not acted upon by acids. Emeralds of large size and free from flaws are rare. The largest on record is said to have been possessed by the inhabitants of the valley of Manta, in Peru, when the Spaniards first arrived there. It was as big as an ostrich egg and was worshiped as "the mother of emeralds." Emeralds were highly valued by the ancients, who are said to have procured theirs from Ethiopia and Egypt. The finest are now obtained from Colombia. The Oriental emerald, though green, is a variety of the ruby and an extremely rare gem. The emerald has been designated as the birthstone for May.

EMERALD ISLE, a popular name for Ireland, given it on account of the rich green of its vegetation.

EMERSON, RALPH WALDO (1803–1882), a beloved American poet and essayist, was born at Boston, Mass. He was graduated from Harvard College in 1825, taught school for five years, and in 1829 became minister of a Unitarian church in Boston. He gave up preaching, although it seems that he was most successful, because he could not accept some of the rites of the Church, notably the Lord's Supper. In 1832 he made a trip to England, where he became acquainted with Walter Savage Landor, Wordsworth, Coleridge and Carlyle. With Carlyle he established a firm friendship, and their correspondence continued for years.

Returning to the United States, he began his career as a lecturer, and it was in this capacity that he was for a long time best known. His lectures on science, history and biography were very popular, by reason of their exhaustless fund of wit, illustration and anecdote. In 1835 Emerson married Miss Lilian Jackson and went to live in Concord, Mass. His first volume, published in the following year, was *Nature,* in which he definitely set forth his creed. This added much to the reputation which he had made by lecturing. As a member of the group known as Transcendentalists, Emerson was one of the original editors of the *Dial,* a transcendental magazine, founded in 1840. Despite his identification with this movement, he had little to do with the Brook Farm scheme, the impracticability of which he saw from the beginning. (See BROOK FARM.)

RALPH WALDO EMERSON

Among Emerson's most important publications were *Essays* in 1841 and 1844; *Poems* in 1846; *Representative Men,* 1850; *The Conduct of Life,* 1860; *May Day and Other Poems* and *Society and Solitude,* in 1861. *The Sphinx, The Humble Bee, The Threnody,* written on the death of his son, *Days,* the *Snowstorm* and *Each and All* are some of his best-known and best-liked poems. Perhaps the most important of Emerson's messages to the world was his teaching that man may rise above circumstances and environment and may make of himself what he chooses; and it is largely through such philosophy as this that he has exerted so wide an influence.

EM′ERY, a stone of a blackish or bluish-gray color. When ground to powder it is used for making emery wheels, emery cloth and emery paper and for polishing. Emery is a variety of corundum and is composed chiefly of alumina and quartz. It is not acted upon by heat or acids.

EMET′IC, a medicine which is administered to cause vomiting. Emetics are very useful in cases of stomach poisoning and in attacks of indigestion when it is important to clean out the stomach quickly. Ipecacuanha is a reliable remedy for croup, as it is sure to provoke vomiting, and this action brings up mucus from the air passages and stops choking. Besides drugs, emetics include irritants applied to the stomach, such as mustard. A dose of lukewarm water is sometimes sufficient to cause vomiting, and mustard in warm water almost never fails to do so. Emetics should be used with caution, as the sensation of nausea which they create is also attended by a weakening of the vitality.

EMIGRATION. See IMMIGRATION AND EMIGRATION.

EMIGRES, *a me gra′*, the name applied to those royalists who fled from France during the French Revolution. After the storming of the Bastille in July, 1789, the first exodus took place, and later in the same year, at the time of the attack on Versailles, a larger number left the country. In 1791, when the Constitution was adopted, another large party left, most of them taking refuge in Holland, Germany or Switzerland. Throughout their exile the émigrés were constantly intriguing with foreign kings to bring about the restoration of the monarchy, and the knowledge of this fact drove the revolutionists to desperation and had much to do with many of the atrocities which were committed. Napoleon, on gaining the consulship, permitted the return of the émigrés. At the time of the Bourbon restoration, they were refused the right to regain their estates or privileges.

EMINENT DOMAIN, the right of a state to force the sale of private property when that property stands in the way of, or is needed for, public enterprises. It is far more common in the United States than in any other country. Congress, with whom the power lies, is limited in its exercise by the Constitution, which declares that no person shall be deprived of property "without due process of law," and that "private property shall not be taken for public use without just compensation." The purposes for which the right may be exercised are many, including not only improvements under the direction of the government, but also public utilities under private ownership and management, such as railroads, street cars and such.

EMIN PASHA, *a′meen pa shah′* (1840–1892), whose real name was Edward Schnitzer, was an African explorer, governor and army surgeon. He was born at Oppeln, Prussia, studied at Berlin and Königsberg, and took a degree in medicine. In 1865 he was appointed surgeon of the Turkish army, and later became surgeon-general of the Egyptian army in the Sudan. General Gordon appointed him in 1878 governor of the equatorial provinces in the Southern Sudan. In 1887 the Egyptian government made him a pasha. When two years afterwards the provinces rose in revolt, he was deposed and imprisoned. On his release he left the country, and was assassinated by Arabs while on an exploring expedition in East Africa.

EMMET, ROBERT (1778–1803), an Irish patriot. He left Ireland in 1798 after his expulsion from Trinity College, Dublin, for exciting rebellion. After spending some time on the Continent and receiving from Napoleon a promise of aid in a struggle for Irish independence, he returned to Ireland and became a member of the Society of United Irishmen, a society which had for its object the independence for Ireland. In July, 1803, he became the leader in a rebellion, was arrested and after a few days, tried and executed. His speeches in his own vindication have been regarded as models of patriotic eloquence.

EMO′TIONS, certain complex feelings aroused by experiences or events that impress one as agreeable, disagreeable, pleasurable, etc. Joy, grief, affection, hope, anger, disgust and fear are typical emotions. Authorities classify the emotions in various ways. One school of thought divides them into the *egoistic*, the *altruistic*, the *moral* and the *religious*. The egoistic relate wholly to self; the altruistic, such as love and anger, are exercised towards objects outside the self, and the moral and religious are combinations of both the egoistic and the altruistic. The moral emotions arise from relations of human beings to one another. They give us the sense of right and wrong, and in so far as they are responsible for our moral standards are strongly egoistic, while in so far as they are exercised towards others, they are altruistic (see ETHICS). The religious emotions are closely allied to the moral and arise from contemplating one's relation to a supreme being. They constitute the highest sentiments of which the mind is capable.

The emotions are expressed in a variety of ways, by the eyes, by the countenance, by gesture and by the tones of the voice, as well as by words. When they are strong they affect the organic functions, such as breathing, circulation and digestion. The emotions increase in strength by continued excitment of them and they exert a strong influence over character and happiness. It is unwise to cultivate any emotion to excess. Anger over-indulged may lead to murder, and joy to hysterics. People have been known to die of excessive emotion.

EM′PEROR, a title given to a ruler, in rank superior to that of king; specifically, the royal head of confederation of states or of an empire. The end of the World War in 1918 banished the term almost entirely from actual application. The emperors of Germany and Austria-Hungary were forced to abdicate, and these two were the most conspicuous examples of autocratic rule among free nations. Only the emperor of Japan and the king of England, as emperor of India, remained, and these were benevolent sovereigns.

EMPIRE DAY, a day set apart throughout the British Empire for patriotic observance in school. The date is May 23. The exercises include the singing of national airs, saluting the flag, reading suitable essays, reciting patriotic verse and reviewing British history and geography. The object is to inspire children with the higher ideals of citizenship and patriotism. All repeat the motto of the day: "One King; one Flag; one Fleet; one Empire," and learn to give the rallying cry: "For God; For Duty; For Empire."

The idea of Empire Day originated with Mrs. Clementina Fessenden, a Canadian, in 1897. The day is observed in Canada, India, Australia, South Africa and in British island possessions.

EMPLOY′ER'S LIABIL′ITY. An employer's liability law is one which defines the responsibility and obligations of an employer in respect to injuries which his workmen receive while engaged in their work for him. Such laws have superseded the interpretations of courts under the common law, whereby most of the risks were assumed by the worker. These later laws are defective, however, in that the injured workman must prove that the fault lies with the employer, and this is sometimes a difficult thing to accomplish. A further development has been the enactment of *workmen's compensation* laws, by which damages for injuries are awarded automatically.

Up to 1919 thirty-seven states of the Union had enacted such laws, as well as Alaska, Hawaii and Porto Rico. In 1916 Congress passed a Federal compensation law covering all civilian employments of the United States government and the Panama Railroad. The New York law, effective July 1, 1914, and amended in 1915, 1916 and 1917, is typical of the most advanced legislation on the subject. It provides compensation for accidental injuries and for diseases or infections contracted unavoidably, in a number of specified occupations. Each employer must insure in a state fund or mutual or stock company, or else must give proof of his financial ability to make payments. Disputes are settled by the State Industrial Commission, with limited appeals to courts.

The subject of workmen's compensation is handled in Canada by the individual provinces. Legislation along this line has been adopted in most of the other British possessions, in nearly all of the European countries and in a few South American republics.

EMPLOYMENT BUREAU, *bu′ro,* any agency intended to bring together employers and the unemployed. There are several kinds of such bureaus; among these are agencies privately owned and operated for gain, agencies privately operated for philanthropic purposes, trades-unions, and free government bureaus. These last have for their object the adjustment of the entire labor market and the consequent improvement of the general economic conditions, whereas the trade unions seek to provide only for their own members. Until the outbreak of the World War there were in France two bureaus subsidized by the government, and in addition to these numerous bureaus under the management of labor unions. In England, in 1914, there were 423 labor exchanges, controlled by a central office in London. Labor exchanges have also done efficient work in Italy and Switzerland. Germany until the outbreak of the World War had a well-organized employment bureau. A municipal bureau had been established in nearly every German city with a population of more than 50,000, and in many of the smaller places.

In the United States comparatively little has been done by the government to prevent unemployment. No doubt the large numbers of private bureaus and the advertising columns of newspapers as a medium for bringing employer and workman together have seemed to make municipal bureaus unnecessary. As a matter of fact, the fraudulent practice of some private agencies makes all the more necessary the assistance of the municipality. Furthermore, the uneducated immigrant oftentimes cannot make use of the newspapers to get himself employment. It is to prevent the exploitation of these last by unscrupulous and dishonest employers that the government help is most needed.

EMPORIA, Kan., the county seat of Lyon County, sixty miles southwest of Topeka, on the Atchison, Topeka & Santa Fé and the Missouri, Kansas & Texas railroads. The city is in a region devoted to farming and stock raising and contains wholesale houses, foundries, woolen and flour mills and canning, carriage and other factories. The Santa Fé has a large railroad and stockyards here. A Federal building was erected in 1913. A state normal school having ten buildings is located here, and the city also contains the College of Emporia, a conservatory of music, a Carnegie Library and a railroad library. It was settled in 1856 and was incorporated in 1870. The commission form of government has been adopted. The city is the home of William Allen White (which see). Population, 1910, 9,058; in 1920, 11,273.

EMS, Germany, a famous watering place, situated in the district of Wiesbaden, in Hesse-Nassau. It is ten miles southeast of Coblenz, on the Lahn River. It was a bathing resort even in the time of the Romans, and since the fourteenth century has been much frequented because of its warm mineral springs, remarkable for their curative properties. In normal times the place is visited by more than 10,000 patients and many tourists each year. In 1172 the counts of Nassau gained possession of Ems, and in 1866 it was united with Prussia. The permanent population of the town is about 6,000.

EMU, or **EM'EU**, a three-toed Australian bird, related to the ostrich, cassowary and rhea. It is large, sometimes weighing 130 pounds, and is distinguished by the absence of a casque, or helmet. Its feathers, which are double, are of a dull, sooty brown; those about the neck and head are hairlike in texture. There are two plumes to each quill, but these have no commercial value. The bird has small, useless wings, but it can run with great speed and uses this method of escape from enemies on the plains. If brought to bay it fights viciously, kicking backward with much force. It is very easily tamed and may be kept out of doors in temperate climates. The flesh is eaten by natives.

THE EMU

EMUL'SION, a liquid mixture in which minute fatty or resinous globules are held in suspension. Milk is a natural emulsion, made up of water and butter fat. A large number of emulsions are manufactured out of water and certain oily or resinous substances, made to mix by a third ingredient, and sold for medicinal purposes.

ENAMEL, *en am'el*, a glaze applied by fusion to gold, silver, copper or other metal surface or to porcelain. The art of enameling, which is of great antiquity, was practiced by the Assyrians and by the Egyptians, from whom it may have passed into Greece and thence into Rome and its provinces, where various Roman antiquities with enameled ornamentation have been discovered. During the twelfth and fourteenth centuries, the Italians acquired considerable skill in enameling, and their work became famous in all the countries of Europe.

The basis of all kinds of enamel is a perfectly transparent and fusible glass, which is rendered either semitransparent or opaque by the mixture of metallic oxides. White enamels are made by melting the oxide of tin with glass and adding a small quantity of manganese or phosphate of calcium to increase the brilliancy of the color. Enamel is used for glazing the cheaper varieties of pottery and for coating iron vessels for domestic purposes, the protection of the insides of baths, cisterns, boilers and the like. Enameling in colors upon iron is now common, iron plates being thus treated by means of various mixtures, and words and designs of various kinds being permanently fixed upon them by stenciling.

ENCYCLOPEDIA, *en si klo pe'di a,* or **CYCLOPEDIA,** a book or set of books in which various departments of knowledge are treated by means of separate articles, in most cases arranged in alphabetical order. A general encyclopedia, such as the one containing this particular article, treats of practically all branches of learning. There are, however, many special encyclopedias in circulation, such as those devoted wholly to biography, to literary subjects, or to medicine.

The oldest work of an encyclopedia nature of which we have any knowledge is Pliny's *Natural History,* but this was far from being a reference work in the modern sense of the term. Several works of a similar character were produced in the Middle Ages, but the name encyclopedia was not applied to any of them until 1559. The term is derived from the Greek word for *circle,* and at first signified the group of subjects which an educated man was supposed to study.

The first English alphabetical encyclopedia was the *Lexicon Technicum; or an Universal English Dictionary of Arts and Sciences,* published in 1704. Ephraim Chambers published in 1728 his *Cyclopedia; or an Universal Dictionary of Arts and Sciences,* which had many distinctive features, especially the use of cross-references to faciliate topical reading, and which had considerable influence on succeeding works of its kind, both in England and on the Continent. The famous French *Encyclopedie,* edited by Diderot, D'Alembert, Rousseau and others, was intended at first as a translation and revision of Chambers' work, but grew into something much more ambitious. Of a somewhat different type from the dictionary style of encyclopedia, described above, is the *Encyclopaedia Britannica,* first published in 1768, which laid stress on important articles on general subjects, rather than on numerous short articles on the subdivisions of these subjects.

Besides those mentioned above, the larger encyclopedias in English include the *Encyclopedia Americana,* Johnson's *Universal Cyclopaedia,* later editions of the *Encyclopaedia Britannica* and the *New International Encyclopaedia,* in over twenty volumes. Of French encyclopedias the most important are the *Encyclopedie des gens du monde;* the *Encyclopedie moderne,* and the *Encyclopedie du XIXeme siecle.* The German *Konversations-Lexikon* of Brokhaus, in seventeen volumes, and the *Konversations-Lexikon* of Meyer, in eighteen volumes, with supplementary numbers, are among the best and most scholarly of any encyclopedias. An encyclopedia dealing with the Roman Catholic Church is a well-known publication.

EN'DICOTT, John (1588?–1665), one of the founders of Massachusetts Bay Colony, and its first governor. He was born in Dorchester, England, and joined the exodus of Puritans to the New World in 1628. He was governor of the colony for several terms and was an uncompromising ruler. Two members of his council who wanted to use the Episcopal prayer book in public worship were, at his command, sent back to England. During his administration several Quakers were put to death in Boston. Endicott was a warm disciple of Roger Williams. He always displayed independence of established custom and authority. He was responsible for the establishment of a colonial mint in 1652.

EN'DIVE, a plant belonging to the same genus as the chicory, cultivated for its root leaves. When blanched, or whitened, these leaves are used in soups and as a salad. There are several varieties of endive, including the curled, narrow-leaved, and the broad, straight-leaved. The former is preferred by Americans. Endive grows well in good soil, and needs about the same care as lettuce, except that it is necessary to blanch the leaves. This is accomplished by tying the outer leaves together. The plant is slightly bitter to the taste.

ENDLESS SCREW, a popular name often given to a screw or other spiral contrivance upon a cylindrical surface which meshes or engages with a toothed wheel. The screw and wheel are on axes at right angles to each other. When the screw turns the wheel turns. This screw is used in fine mechanical adjustments where great precision is required, such as telescope mountings, in the transmission mechanism of motor vehicles and in electric elevators.

ENDYMION, *en dim'i on,* in Greek mythology, a shepherd of great beauty, who won the love of Selene (Diana). There are several versions of the myth. According to one, Selene, seeing the shepherd one night as he lay asleep on a hillside, left her chariot and kissed him. Fearful lest age should lessen his beauty, she begged for him from Zeus (Jupiter) the gift of endless sleep and carried him off to a cave on Mount Latmus.

EN′EMY, in international law, either of two sides in a conflict of nations from the standpoint of the other. While any officer of a belligerent nation is considered, strictly, an enemy of the other party to the struggle, modern usage has practically determined that minor civil officers, not in any way connected with the war, and non-combatants of nations at war are not liable to capture, detention or punishment. It was violation of this law which brought down upon Germany the wrath of her enemies in the recent World War. For a statement of the general rules of international law in force during times of war, see article WAR; INTERNATIONAL LAW; NEUTRALITY.

ENERGY, *en′ur jy*, in physics, the power which a body or system possesses for doing work. Energy is of two kinds, *potential*, or possible, energy, due to position, as that of a sledge in air or a stone propped upon the side of a hill, or the energy which lies dormant in explosives, such as shrapnel. When the sledge descends, the stone rolls downhill or the gunpowder explodes, this passive energy is converted into active, or *kinetic* energy, producing motion. All energy is convertible, but it cannot be created or destroyed. An electric light plant using steam power affords an excellent illustration of the change of potential to kinetic energy. The potential energy in coal is made active by burning, which causes it to give off heat. The heat is used in changing the water to steam and this is then transformed to motion in the engine. The motion is imparted to the dynamo, which in turn generates the electric current, and this is changed back to heat in the electric light. Some of the heat generated by the coal is consumed in the running of the engine and the dynamo and in traversing the wires, so that it is not all converted into light; yet it is all used in one form of energy or another.

ENGINE. See GAS ENGINE; STEAM ENGINE.

ENGINEER′ING is both the art and the profession of construction. The men who practice it are known as engineers, but as this great division of skilled labor is highly specialized, they are commonly referred to as *civil* engineers, *mining* engineers, *electrical* engineers, *mechanical* engineers, etc.

The world owes a vast debt to the specially trained men who have performed seeming miracles one after another until we are no longer surprised at the feats which have added immeasurably to comfort, to business, to pleasure and to the wealth of the world.

The men who behold a stream trickling down a mountain side and who guide that stream through ditches and sluices scores of miles that it may make fertile millions of acres of arid land are *civil* engineers, and empire builders. They who build great power houses and fill them with dynamos and harness these to waterpower so the electric current can be sent cheaply hundreds of miles to light cities and turn the wheels of industry are *electrical* engineers. The patient men who once looked upon a two-cylinder automobile engine and found it good, but not good enough, then developed it into the present twelve-cylinder engine are *mechanical* engineers.

The engineers of the world have built monster bridges with no supports for a third of a mile; they have built fortresses which it was thought no cannon could crumble, and other engineers have straightway constructed guns that would destroy them; they have laid ribbons of iron across a continent, opening vast areas to homes for future generations; they have sunk foundations scores of feet to bed-rock and on these sure supports have projected buildings skyward until under their unerring mathematics there is no limit to the heights to which structures may be safely built. These are some of the amazing things that engineering has accomplished.

The work of the world calls more and more for specialized knowledge, and to-day any man's hope is only that he may master one branch of useful learning. There is no profession more honorable or more remunerative than that of engineering. It requires special aptitude, however. The engineer must thoroughly understand all of higher mathematics; the boy with a settled dislike for arithmetic would doubtless fail to qualify along the route of trigonometry and calculus for an engineer's diploma. The boy who has no liking for machinery would have to be very optimistic to believe that he would succeed in an engineering career. In addition, the engineer must be a leader of men; no others need aspire. Their brains conceive and other men must execute, under his strict orders. Given the latent talent, a capacity for hard work, a readiness to wear overalls and to breast the elements under the open sky, any boy may hope to become an engineer. He will find a score of great schools equipped to speed him along.

ENGLAND, the chief political division of the United Kingdom of Great Britain and Ireland, occupying the southern portion of the island of Great Britain. England has a unique place among the nations. In area not much larger than New York, in importance it is second to no other country on the globe, and its influence on the world's history has been profound. It is the center of an empire which reaches to every continent and borders on every ocean; the seat of government of this great domain, the city of London, is the largest city in the world, if the entire metropolitan area is included.

Location and Size. The island of Great Britain is composed of three political divisions—England, Scotland and Wales. England lies south of Scotland and is separated from it by the Cheviot Hills, the River Tweed and Solway Firth. Wales is a broad peninsula jutting out from the west coast of the island mass, which is separated from Ireland by the Irish Sea and Saint George's Channel. The English Channel, Strait of Dover and North Sea separate England from the continent of Europe.

The area of England, exclusive of Wales, is 50,874 square miles; thus it is between Alabama and New York in size. Its greatest length from Tweedmouth, in the northeast, to Saint Alban's Head, on the south, is nearly 365 miles, and its greatest width, from Land's End to North Foreland, is 320 miles. The coast line is very irregular, cut on all sides by deep indentations, which form fine harbors.

The People and Their Cities. At the outbreak of the World War there were living in England about 34,050,000 people, over three times as many as live in the state of New York. Almost eighty per cent of the inhabitants live in cities or towns, a proportion of urban population nowhere else equaled. Besides the city of London, England has fifteen municipalities with more than 200,000 inhabitants, and twenty-five with populations ranging from 100,000 to 200,000. The fifteen referred to are Birmingham, Liverpool, Manchester, Sheffield, Leeds, Bristol, West Ham, Bradford, Kingston-upon-Hull, Newcastle-upon-Tyne, Nottingham, Stoke-on-Trent, Salford, Portsmouth and Leicester.

At the census of 1911 the average density of population per square mile was 669, as compared with 34.3 for the United States proper in 1916. It is thus evident that England is at present one of the most densely populated countries in the world. Its population for years prior to the World War showed a steady increase.

The English people exhibit decided racial characteristics. Tenacity is so marked a national trait that the expression, "to hang on like John Bull," has become proverbial everywhere. England's armies have taken blow upon blow, but never have they lacked the resolution to hit back, and it has been commonly said that "the English soldier can fight as long as any other soldier—and fifteen minutes longer." The English are a people who grow strong under adversity. This quality of endurance has had much to do with shaping their history. From an early period the common people have persistently labored for their rights, and to-day England, though a monarchy in name, has one of the most democratic governments in the world.

The people of England have excelled, too, as explorers and colonizers. That small country, with its 2,000 miles of coast line, bred a race of sailors and became the "mistress of the seas." Its people have gone as colonizers to every continent, and it is significant that among its colonies are some of the world's self-governing nations, such as Canada, South Africa and Australia.

In science the English are surpassed by no other race in creative achievements. It was an Englishman who discovered the law of gravitation, and an English scholar who worked out the theory of evolution, perhaps the most important scientific discovery of modern times. In chemistry and in medicine their contributions have been no less notable, and from England came those inventions that made a new industrial world—the steam engine and locomotive, the power loom and the Bessemer process of making steel. Finally, the English have produced a literature that is the equal of the best in the world.

Education. Before the World War England's national educational system was defective in that it lacked centralization and authority, but in the midst of that great struggle the nation came to realize the need of reforming the system. An educational bill supplementing previous acts and reorganizing the public schools was passed by Parliament in 1918, receiving the king's signature in August of that year. The act is effective for England and Wales. Local educational units throughout the country are required to maintain both elementary and continuation schools, half the expense of which is met by the national government. Attendance on the elementary schools is compulsory for children from five to fourteen years of age, and children who have not received full time elementary education must attend the continuation schools until they are sixteen. In 1925 this limit will be raised to eighteen years. The number of hours per year which must be spent in the continuation schools is 320. Schools exemptions under the age of fourteen were abolished, and child labor of school children under twelve forbidden.

The well-to-do classes of England have always sent their children to private schools, but the act of 1918 is part of a movement to make the educational system more democratic. Famous among the private institutions for boys are the schools at Eton and Rugby. There are several great universities, the oldest and most famous being Oxford and Cambridge, described elsewhere in these volumes. Besides these institutions there are the universities of London, Durham, Birmingham, Liverpool, Leeds, Sheffield and Bristol, and the Victoria University of Manchester.

Surface and Drainage. England is noted for the picturesque character of its country landscape, but it possesses no scenery like that of Switzerland or Scotland. The highest elevations are in the northern part of the country. Here is located the Pennine Chain, whose highest point, Cross Fell, has an altitude of 2,930 feet. West of Pennine range and its adjoining Cumbrian range is another, whose average altitude is greater. This extends southward and covers the greater part of Wales. South of the Bristol Channel and extending into the point of land comprising the counties of Somerset, Devon and Cornwall, is the Devon range, which is much lower than the ranges in the north. In the extreme northwest, between Morecambe Bay and Solway Firth and occupying the counties of Cumberland and Westmoreland, is the Lake District, so called because it contains a number of small mountain lakes, noted for their beauty. In this region is the highest point in England, Scafell Pike, 3,210 feet. All of the southern and eastern portion of England is low land and consists of rolling country, with slight rounded elevations separated by more or less broad, undulating valleys.

England is well supplied with rivers, many of them of great importance to industry and commerce. Nearly all of these flow into the North Sea. The most important streams are the Thames, on which London is located, the Ouse and the Humber, flowing into the North Sea, and the Mersey and the Severn, flowing into waters tributary to the Atlantic. Other streams worthy of mention are the Tyne, Wear and Tees, in the northeast, and the Eden, Ribble and Dee, in the northwest.

Climate. England lies as far north as Labrador, but its climate is tempered by the Gulf Stream; its winters are therefore comparatively mild, and its summers are cool. Dense fogs are frequent, especially in London, where they are intensified by the soot and smoke of that huge industrial center. The country enjoys an abundant rainfall, especially in the Lake Region, where it is over sixty inches a year.

Mineral Resources. England contains extensive deposits of coal, iron ore and clays, and it furnishes about three-fourths of the entire mineral products of the United Kingdom. Minerals of lesser importance are copper, zinc, tin, salt and gypsum. The coal areas extend irregularly from north to south, slightly west of a line drawn through the center of the country. In 1916 the output was 255,850,000 tons, but this great total was none too large considering the demands of the war. The iron ore and limestone necessary for a flux in smelting occur in or near the coal regions. Tin in considerable quantities is found in Devon and Cornwall.

Fisheries. The fisheries are important, and the larger part of the fish taken by the

United Kingdom is obtained off the coasts of England and Wales. The most important centers of the industry are Grimsby, Hull and Yarmouth, and nearly all of the product goes to London, which is the largest fish market in the world. Herring, haddock, cod and mackerel are the varieties taken in largest numbers.

Agriculture. The agricultural system in England is on a different basis from that in most other countries. The greater part of the cultivated land is owned by a comparatively small number of landlords, who parcel out their estates in small sections and rent them to tenant farmers. Since these small farms usually remain generation after generation in the hands of the same family, the system tends to develop a sense of ownership among the tenants. The abuses and the advantages of this system are brought out clearly in such stories as George Eliot's *Adam Bede* and Mrs. Humphry Ward's *Robert Elsmere.*

The land is very fertile, and the most improved methods of cultivation are followed, but, nevertheless, before the outbreak of the World War England did not raise enough agricultural produce to feed the home population. Grain could be imported cheaper than it could be raised at home, and foodstuffs were shipped there in great quantities. The demands of the war entirely changed English agriculture. Large areas of lovely park and meadow land, untouched by the plow for centuries, were brought under cultivation, and every labor-saving device that could be used to advantage was put to service. Especially valuable was the tractor for plowing, and women proved to be very capable in running this machine. In 1917 the wheat yield for England and Wales was estimated at 57,317,000 bushels, that of barley 46,162,000, and that of oats 99,717,000. The potato crop the same year was about 124,278,000 bushels, and there was a correspondingly large yield of other garden vegetables. It is not likely that England will ever return to the old system, now that the country has learned to feed itself.

Stock raising is a very important branch of agriculture. England raises several famous breeds of stock, notably the Durham and Devonshire breeds of cattle, the Cotswold and Southdown sheep, and the Berkshire pigs.

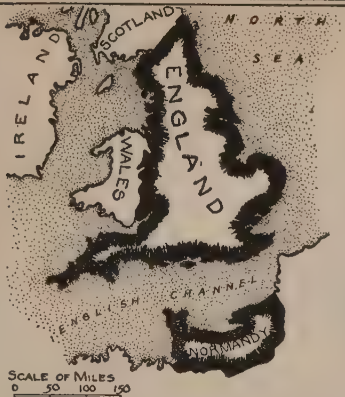
Manufactures. England is one of the greatest manufacturing countries in the world, more than five times as many people being engaged in manufacturing as in agriculture. The chief manufacturing centers are in the vicinity of the coal and iron fields, extending from the center of the country northward along the western side. The most important industry is the manufacture of textiles, in which cotton and woolen goods take the lead. Manchester is the chief city of cotton manufacture and the largest center of this industry in the world, and the county of Yorkshire contains the largest number of woolen mills, the center of the industry being at Leeds. The great iron foundries are found in the central counties in and about Birmingham and Sheffield, the latter city being noted for its manufacture of cutlery of all kinds. Aside from these great industries, there are numerous others, such as the manufacture of pens, pins, needles and countless other small articles and small wares. In itself each of these industries is comparatively unimportant, but when taken together, they constitute an important factor in the manufacturing industry of the country and of the world. The position which England has held for so long as a manufacturing nation is due to the presence of large quantities of coal and iron, to a temperate climate, to facilities for reaching the markets of the world and, perhaps more than all else, to the ingenuity and industry of the people.

History. England's recorded history begins with the invasion of the island (then called Britain) by Caesar, in 55 B. C. Before that time the Phoenicians, Carthaginians and Greeks had visited it to procure tin. It was not until the time of Claudius, nearly one hundred years after Caesar's invasion, that a serious attempt was made to reduce Britain to the condition of a Roman province, and it was not until the time of Agricola that the inhabitants may be said to have been in any degree Romanized. The entire island did not submit to the Romans at any period, and at various times walls were built across it to ward off the attacks of the northern tribes whom the Romans had been unable to subdue. Under the Roman dominion the southern part of the island advanced considerably in civilization. Flourishing towns were built, great roads were constructed and Christianity was introduced.

But soon after the beginning of the fifth century, the Romans found it necessary to

ENGLAND

To the Norman Conquest



Dominions of William the Conqueror (in black) after the Battle of Hastings

Great Men	
St Augustine A.D.	354- 430
Caedmon	?- 680
The Venerable Bede	673- 735
Egbert	?- 839
Alfred the Great	849- 901
St Dunstan	925- 988
Canute	994-1035
Edward	1004-1066
Harold	1022-1066

Chronological Summary	
First Visit of Julius Caesar to Britain B.C.	55
Roman Troops Withdraw A.D.	407
Landing of Hengist and Horsa	449
Egbert became King	829
Alfred the Great became King	871
Canute became King	1016
Edward the Confessor became King	1042
Harold Elected King	1066
Battle of Hastings	1066

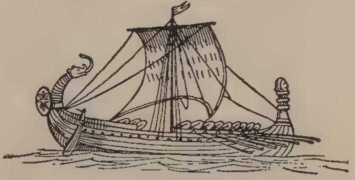
The Legend of Alfred and the Cakes

Coin of King Edgar
Ruler from 959 to 975

Stonehenge

A Druid Priest in Official Robes.
The Druids Worshipped the Same Gods as the Greeks and Romans

Harold (From an Old Coin)



Norman War Vessel
Eleventh Century

William the Conqueror

Briton of the 3rd Century

H·M·HAINES

withdraw their armies from Britain, and the inhabitants of the country who had been for centuries protected by the Romans, found themselves utterly unable to repel the invasions of their northern neighbors. They therefore called on the Jutes to aid them, but soon found that the Jutes intended to repay themselves by making settlements on the island. Other tribes from the mainland, chief among them the Angles and the Saxons, also descended upon Britain and soon overran the country. The English of to-day have strains of all these peoples.

Of the political divisions into which the conquered territory was divided by the Angles and Saxons, the most conspicuous were the seven small kingdoms commonly known as the *Heptarchy*. Gradually the more powerful of these came to dominate the weaker ones, and by 827 Egbert, king of Wessex, had made himself king of the entire country. From this year the kingdom of England (Angle-land) may be considered to date, and Egbert's descendants ruled in England, with the exception of a short period of Danish power, until 1066. In the early strife between the Angles and the Saxons, the civilization of the Romans had been completely overthrown, and Scandinavian mythology had taken the place of primitive Christianity. By the sixth century, however, the Christian religion had been reintroduced by Saint Augustine and his successors.

Meanwhile, the Danes had been constantly harassing the coast, and they gradually obtained a firm foothold on the island. When Alfred the Great ascended the throne, in 871, he found them practically masters of his kingdom. But he succeeded in reducing their power, confined them to a certain part of the country and forced them to do him homage. The successors of Alfred, Edward (901–925) and Athelstan (925–940), were again obliged to contend with the Danes, who were constantly issuing from the Danelagh, the territory to which Alfred the Great had confined them. Among the chief political characteristics of the rule of the Saxons in England was the growth of the power of the king, and the early establishment of the Witenagemot, without the sanction of which the king was supposed to undertake nothing of importance. A really strong king, however, might often set aside the Witan and rule almost absolutely.

By 1013 the Danes under Sweyn had made themselves masters of the greater part of England, and Sweyn's son Canute, who succeeded him in 1016, firmly established the Danish rule. Harold and Hardicanute succeeded Canute, and on the death of Hardicanute in 1042 the English line again came to the throne in the person of Edward the Confessor. Edward died in 1066, and Harold, his brother-in-law, was chosen king. He ruled but a few months, however, as William of Normandy, who claimed the throne partly through his relationship to the royal Saxon line, partly through a promise which he said had been made him by Edward the Confessor, descended upon England in 1066 and defeated Harold at the Battle of Hastings. By Christmas day William had brought a large part of the island into subjection, and on that day he was crowned in London. It was not until some years later, however, that the complete subjugation of the island was accomplished.

With the reign of William I begins the history of united England, and the monarchs who have ruled since then are shown in the following table:

RULER	DATES OF REIGN
William I the Conqueror	1066–1087
William II	1087–1100
Henry I	1100–1135
Stephen	1135–1154
Henry II	1154–1189
Richard I	1189–1199
John	1199–1216
Henry III	1216–1272
Edward I	1272-1307
Edward II	1307-1327
Edward III	1327-1377
Richard II	1377–1399
Henry IV	1399–1413
Henry V	1413–1422
Henry VI	1422–1461
Edward IV	1461–1483
Edward V	1488–1483
Richard III	1483–1485
Henry VII	1485–1509
Henry VIII	1509–1547
Edward VI	1547–1553
Mary	1553–1558
Elizabeth	1558–1603
James I (Stuart)	1603–1625
Charles I	1625–1649
(Commonwealth)	1649–1660
Charles II	1660–1685
James II	1685–1688
William III	1689–1702
Anne	1702–1714

During the reign of Anne, in 1707, the two countries of England and Scotland were united constitutionally, and the title of the sovereign became officially not *King of Eng-*

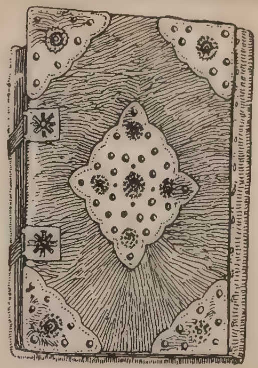
ENGLAND
DURING THE MIDDLE AGES

GEOFFREY CHAUCER
THE FATHER OF
ENGLISH LITERATURE

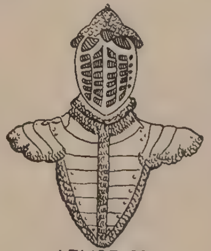
TYPE OF RESIDENCE ABOUT 1400.

GOLD NOBLE OF
1344
(REDUCED ONE HALF)

RICHARD I
"THE LION HEARTED"

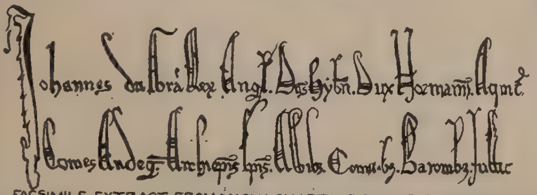

DOMESDAY BOOK

NORMAN GATEWAY OF WINDSOR CASTLE
PLANNED BY WILLIAM THE CONQUEROR


ARMOR OF
12TH CENTURY

WESTMINSTER ABBEY
COMPLETED THE LATTER HALF OF 13TH CENTURY

ROYAL APPAREL
YEAR 1300


Johannes dei gra Rex Angl. Dns hybn. Dux Normann. Aquit. &
Comes Andeg. Archiepis. Epis. Abbis. Comit. Baronib. Justic.

FACSIMILE EXTRACT FROM MAGNA CHARTA, SIGNED BY KING JOHN

Chronological Summary

William I	1066
Domesday Book	1086
William Rufus	1087
Henry I	1100
Stephen	1135
Henry II	1154
Thomas à Becket	1170
Richard I	1189
King John	1199
The Magna Charta	1215
Henry III	1216
Edward I	1272
Edward II	1307
Edward III	1327
Battle of Crécy	1346
The Plague	1349
Battle of Poitiers	1356
Richard II	1377
Henry IV	1399
Henry V	1413
Battle of Agincourt	1415
Henry VI	1422

H M HAINES

land but *King of Great Britain and Ireland.* The remaining rulers of this list, therefore, bear that longer title:

George I	1714-1727
George II	1727-1760
George III	1760-1820
George IV	1820-1830
William IV	1830-1837
Victoria	1837-1901
Edward VII	1901-1910
George V	1910-

The rulers are treated in separate articles under their proper headings.

At William's death in 1087 his second son came to the throne as William II, and he was followed on his death in 1100 by his younger brother Henry. Henry's reign was much disturbed by the attempts of Robert, Duke of Normandy, eldest son of William I, to gain the throne, but Henry was able to strengthen his hold on the kingdom and even to gain possession of Normandy. Henry had chosen as his successor his daughter Matilda, wife of Geoffrey Plantagenet, Count of Anjou, but Stephen, a grandson of William the Conqueror, raised an army in Normandy and attempted to seize the throne. After years of fighting with varying results it was agreed that Stephen should reign until his death, and that he should accept as his successor Henry, the son of Matilda. Stephen lived but a year after this arrangement was made, and in 1154 Henry, the first of the Plantagenets, came to the throne as Henry II.

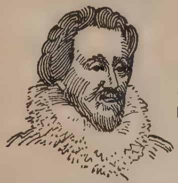
Henry II proved to be one of the strongest of English kings. He put down the great barons who had established themselves in their castles and made themselves scourges to the country about them, and he established a just and orderly government. One of the most important events of his reign was his contest with the Church, the powers of which, despite his enforced submission to the Pope after the murder of Becket, he very materially lessened. Henry, whose possessions in France exceeded in extent his English kingdom, had spent little of his time in England, and his son, Richard I (1189–1199), who succeeded him, was in England only one year during his reign. In his absence the nobility succeeded in increasing their power at the expense of the royal authority.

John (1199–1216), who succeeded Richard, while in some ways an able man, was untrustworthy and weak, and during his reign England lost all of its possessions in France. This separation of the two countries in the end worked good to England, as it compelled the Norman barons in England, who up to this time had thought of France as their home country, to recognize themselves as subjects of an English king. John's weakness was beneficial to England in another way, because it allowed the barons, with the support of the people, to wrest from him the Great Charter of Liberties. John's son, Henry III (1216–1272), succeeded him, and much of this reign was taken up with troubles with the barons, which in the end resulted in a confirmation of the Great Charter. It was during this reign that the first House of Commons was assembled.

Edward I (1272–1307) proved himself a stronger king than his two predecessors and reduced the country to order. It was in his reign that Wales was finally united with England, and that the fierce struggle with Scotland began, which continued, at intervals, for centuries. Edward, by his defeat of William Wallace, gained some advantage in Scotland, but under Edward II this was lost, and after the victory of Robert Bruce at Bannockburn in 1314, the independence of Scotland was recognized. With Edward III (1327–1377) began the long struggle with France known as the Hundred Years' War. Edward, with his son, the Black Prince, won brilliant victories, which, however, meant no permanent advantage for England, while the great expense of the war was a serious drain on the country. Two important results of the contest to England were the strengthening of the national feeling, which resulted from the union of the Normans and Saxons against France, and the increased power which Parliament secured because Edward III was dependent upon it for supplies.

Richard II (1377–1399) proved but a weak king, and after several uprisings, chief of which was the insurrection under Wat Tyler, he was dethroned by Henry, Duke of Lancaster, who came to the throne as Henry IV. The persecution of the Lollards and the frequent rebellions headed by supporters of the deposed king, Richard, were the chief events of this reign, which, however, was of importance in the growth of constitutional government in England by reason of Henry's respect for the authority of the Parliament which had proclaimed him king. The reign of Henry V (1413–1422), was spent chiefly in the prosecution of the Hundred Years' War, and so successful were the English that Henry was able to wring from the French

England Under the Stuarts



KING JAMES I

THE FIRST STUART

COSTUME, TIME OF CHARLES I

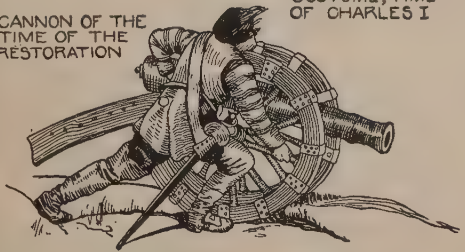
OLIVER CROMWELL WHO INTERRUPTED THE SUCCESSION

CHARLES I

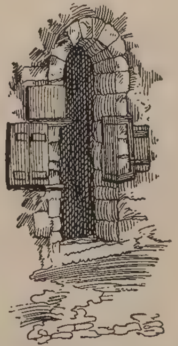
THE LAST STUART

QUEEN ANNE

OFFICER'S HELMET

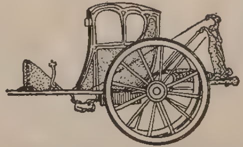


CANNON OF THE TIME OF THE RESTORATION



ENTRANCE TO CELL OF SIR WALTER RALEIGH IN THE WHITE TOWER

HOUSE OF THE PERIOD



EIGHTEENTH CENTURY CHAISE

MILTON'S HOME

VAULT BENEATH THE HOUSE OF LORDS ASSOCIATED WITH THE GUNPOWDER PLOT

WILLIAM AND MARY

NOTED WRITERS OF THE PERIOD

SHAKESPEARE.
BACON..........
JONSON..........
RALEIGH..........
MILTON..........
BUNYAN..........
DRYDEN..........
DEFOE..........
POPE..........
SWIFT..........
ADDISON..........
BUTLER..........

CHRONOLOGICAL SUMMARY

ACCESSION OF JAMES I	1603
GUNPOWDER PLOT	1605
ACCESSION OF CHARLES I	1625
EXECUTION OF CHARLES I	1649
COMMONWEALTH FOUNDED	1649
CROMWELL BECAME PROTECTOR	1653
DEATH OF CROMWELL	1659
ACCESSION OF CHARLES II	1660
PLAGUE AND FIRE AT LONDON	1665-66
ACCESSION OF JAMES II	1685
ACCESSION OF WILLIAM AND MARY	1689
ACCESSION OF ANNE	1702
UNION OF SCOTLAND AND ENGLAND	1707

king, Charles VI, a promise that the English king should succeed him on the throne of France. After the death of Henry V and the succession of his son, Henry VI, who was but a boy, the French, with the aid of Joan of Arc, defeated the English and obliged them to relinquish their claims on France.

In the reign of Henry VI (1422–1461), began the long factional struggle known as the Wars of the Roses. In the course of these wars Henry VI was several times dethroned and again restored, but ultimately Edward IV, the head of the House of York, firmly established his hold on the throne. After the short reign of Edward V, which was a reign in form only, Richard III usurped the power, but he was overthrown in 1485 at the Battle of Bosworth, and Henry, Earl of Richmond, came to the throne as Henry VII. He was the first of the Tudor dynasty. The new king was a man of ability, and he successfully upheld the royal authority, at the expense of Parliament and the nobles, so that his son, Henry VIII (1509–1547), found himself, at his accession, in the possession of great power.

The reign of Henry VIII was chiefly noteworthy for the beginnings of the Reformation in England (see REFORMATION; HENRY VIII), which arose not through any desire of Henry's to found a new ecclesiastical system, but from a contest of the king with the Pope on a personal matter. Edward VI (1547–1553), Henry's son, carried on the work of the Reformation, but on the accession of Henry's daughter Mary (1553–1558), the most strenuous efforts were made to restore the Catholic religion. Cranmer, Ridley and Latimer were the most illustrious of the many victims of this attempt to crush out the Reformation in England. Mary's efforts, however, were in the end vain, as her half-sister, Elizabeth (1558–1603), on her accession reëstablished the reforms which her father had instituted, and by the Act of Supremacy had herself proclaimed head of the Church in England. One important result of this move of Elizabeth's was the increase in the feeling of nationality in England, and this growth was also promoted by the defeat of the Armada. During Elizabeth's reign Ireland was entirely reduced to dependence on England.

When Elizabeth died, James VI of Scotland, son of Mary Queen of Scots, succeeded her on the throne as James I, and established in England the Stuart dynasty. Despite this union of the crowns of the two countries, a complete union was not accomplished for over one hundred years. At the outset of his reign, James, by his statement of the doctrine of the "divine right of kings," instituted a controversy with Parliament which ended disastrously for his son. This reign is noteworthy in the history of America, because during it were founded the colonies in Virginia and in Massachusetts.

Almost immediately after the accession of Charles I (1625–1649), the struggle with Parliament reached a crisis. Charles prorogued his first two Parliaments, and although he was compelled by the Parliament which convened in 1628 to assent to the Petition of Right, he assembled no Parliament for eleven years after that time and ruled almost as arbitrarily as Louis XIV of France. The persecutions of the Puritans, the attempt to force the Anglican liturgy on the Scottish Church and the continued disregard of the necessity of calling a Parliament finally brought matters to a head, and when, in 1640, Charles did assemble a Parliament, because he found that he must have its aid in putting down the risings in Scotland, Parliament took matters into its own hands and impeached the king's ministers.

The contest soon led to open war. After several years of varying fortunes the war ended in the defeat of Charles, who gave himself up to the Scottish army. He was handed over to the English Parliament and in 1649 was tried, convicted of treason and put to death. The strongest man in Parliament and in the army, Oliver Cromwell, soon showed himself the natural head of the country, and he was able by 1653 to make himself Lord Protector of the commonwealth and to rule almost absolutely until his death in 1658. Cromwell's son proved but a weak successor, and by 1660 the royalists were able to bring about the restoration of Charles II, who was most enthusiastically greeted on his return to England. This reign (1660–1685), during which in its foreign policy England was little more than a dependency of France, and the court and society were more licentious than at any other period of English history, passed without any serious protests against the arbitrary character of Charles, so glad were the people to have again a king of the royal line.

Before the death of Charles, attempts were made to exclude from the succession his brother, James, because he had adopted the Roman Catholic religion, but these proved unsuccessful, and James succeeded to the throne without a struggle. The pronounced favor which he showed to Catholics, his setting aside of the Test Act, his proclamation of a declaration of indulgence and, finally, in 1688, the birth of a son who, it was feared, might be trained in the Catholic religion and might continue his father's policy, led many of the great nobles of the country to dispatch an invitation to William and Mary, the son-in-law and daughter of James, to accept the English throne. On their landing, late in 1688, James fled, and William and Mary were proclaimed sovereigns without striking a blow.

During William's reign the Dissenters were allowed freedom of worship, and a step was taken in the direction of true constitutional government, by the declaration of the responsibility of the king's ministers to Parliament. In foreign affairs the reign was taken up largely with the struggle with Louis XIV of France, and William died just when he had begun preparations for another struggle with Louis. Anne (1702–1714) continued his plans, and her reign was made brilliant by the successes of Marlborough in the War of the Spanish Succession. It was during the reign, in the year 1707, that the legislative union of England with Scotland was finally accomplished. England's history since that date is related in the article GREAT BRITAIN.

Other Facts. Information regarding the transportation and commerce, government and religion of England will be found under appropriate subheads in the article Great Britain. English art is discussed under the headings Painting and Sculpture, and the language and literature under the titles English Language and Literature, subhead English Literature.

Related Articles. Consult the following titles for additional information:

GEOGRAPHY

Aldershot
Avon (river)
Birmingham
Blackburn
Bolton
Bradford
Brighton
British Empire
Canterbury
Channel Islands
Chester
Coventry
Derby
Dover
English Channel
Exeter
Gloucester
Greenwich
Halifax
Huddersfield
Hull
Kenilworth
Leeds
Land's End
Leicester
Lincoln
Liverpool
London
Manchester
Mersey (river)
Newcastle-upon-Tyne
Norwich
Nottingham
Oxford
Plymouth
Portsmouth
Sheffield
Southampton
Stratford-on-Avon
Thames (river)
Trent (river)
Yarmouth
York

HISTORY

Anglo-Saxons
Armada
Bannockburn
Barebones Parliament
Boyne, Battle of the
Cavaliers
Church of England
Commonwealth of England
Crecy
Crusades
Domesday Book
Feudal System
Field of the Cloth of Gold
Gunpowder Plot
Hastings, Battle of
Hundred Years' War
Lancaster, House of
Long Parliament
Magna Charta
Normans
Petition of Right
Plantagenet
Reformation, The
Renaissance
Roses, Wars of the
Ryswick, Treaty of
Tower of London
Tudor
Witenagemot
York, House of

BIOGRAPHY

Alfred the Great
Bruce, Robert
Canute
Cromwell, Oliver
Edward, the Confessor
Edward, the Black Prince
Harold I
Joan of Arc
Latimer, Hugh
Mary Stuart
Montfort, Simon de
Raleigh, Sir Walter
Tyler, Wat
Wallace, William

ENGLAND, CHURCH OF, the State Church of England. Christianity was established in England in the sixth century through the efforts of Saint Augustine, and until the Reformation the English Church was a branch of the Roman Catholic. The present organization dates from the reign of Henry VIII, who was responsible for the struggle which resulted in the abolition of Papal authority in England. Henry was made the supreme head of the Church and at the time contemplated no change in doctrines and no separation into rival communities. However, the king dissolved the monasteries and expended the treasures of the Church on himself and court. These high-handed measures retarded any reform movement that might have been made and caused a general discontent, not only among the officials but among the communicants of the Church. During the reign of Edward VI the influence of the Reformation was strongly felt in England, and there were many men who sympathized with Luther, Calvin and other leaders of that movement; England probably would have become Protestant at that time had not the king been succeeded by Mary, who was a Catholic. During her reign there was a strong reaction. During the reign of Elizabeth, however, there was a final separation from the Papacy, and the Thirty-nine Articles (see ARTICLES, THE THIRTY-NINE) were put in their present form.

There are three more or less distinct parties in the Church, known as the *High Church*, *Broad Church* and *Low Church*.

The High Church adherents are nearest the Roman Catholics in forms of worship and belief; the Low Church advocates simplicity in worship and is opposed to Ritualism. Between these is the Broad Church group.

The ecclesiastical law of England is very simple. There is no formal constitution, but the Church is governed by about 150 canons. Parliament with the sovereign may impose any law on the Church. Convocations are called for the purpose of considering ecclesiastical subjects. The country is divided into two provinces, Canterbury and York, with an archbishop in each, the Archbishop of Canterbury being the primate of all England. Each province is divided into dioceses, over which are bishops. Next to the bishops in order of rank are the archdeacons and deans, followed by canons, prebendaries, rectors, vicars and curates. Many of the churches have large endowments, and the support of their clergy is entirely independent of the congregation. The Church maintains effective missionary societies and other auxiliary organizations and has missions in various parts of the world. The corresponding organization in America is the Episcopal Church (which see).

ENGLISH CHANNEL, the arm of sea which separates England from France. It extends on the English side, from Dover to the Land's End, and on the French, from Calais to the Island of Ushant. It is twenty miles wide at its narrowest point and 140 miles wide at its widest point. The French call it *La Manche,* meaning *the sleeve.* The Seine is the only important river that flows into it. The Isle of Wight and the Channel group are the principal islands in the Channel, and the chief ports are Plymouth, Falmouth, Southampton, Portsmouth, Brighton and Dover, in England, and Cherbourg, Havre, Dieppe, Boulogne and Calais, in France. The Channel is noted for its roughness, for windstorms on it are frequent, and it is the meeting place of opposing currents from the Atlantic and the North Sea.

During the World War this arm of the sea became a transportation route of supreme importance, as it was the route followed by countless ships bearing men and supplies from England to France. The great German drive for the Channel ports in the spring of 1918 would, if successful, have given the central powers command of the Channel and multiplied the burdens of the allies. It is possible that some day England and France will construct a tunnel beneath the Channel; the project has long been discussed.

ENGLISH LANGUAGE, the language spoken by the people living in the British Isles and the United States and in the most of their possessions and colonies. The foundation of this language is the speech of the ancient Angles and Saxons, who separated themselves from their Teutonic brothers in the north of Europe and crossed to England in the fifth and sixth centuries A. D. They found here the Britons, speaking a Celtic dialect; and though, after one hundred fifty years of hard and incessant fighting, they succeeded in driving the natives to the north and west, that ancient language has persisted through the intervening centuries and a survival of it is found to-day in Wales.

The simple, strong and forceful words of the English language come from the Anglo-Saxon. The highly inflected Anglo-Saxon language was little modified until the Norman Conquest, when French was made the language of the court and of law. The English people would not accept this new speech, and for two hundred years two languages with many dialects were spoken in this little island. About 1250 there began an amalgamation of the two tongues. At the same time the complicated inflections began to be dropped. In less than two hundred years a new language was taught in the schools and heard in the courts of law. This language was for the most part the English heard to-day.

Of this new composite language, the Anglo-Saxon had furnished the common words of the home, the farm and every-day life; while the Norman had introduced the words that pertained to the court, society, sports and law. Under the Italian influence, which lasted from 1400 to 1660, many more words of Latin origin were incorporated into our speech. The recent developments in science have brought a large influx of technical terms, generally derived from the Latin and the Greek. So in thirteen or fourteen centuries an Anglo-Saxon vocabulary of possibly 30,000 words has expanded into the rich and full English language of more than 300,000 words, of which a large majority have been adopted from foreign tongues. Yet the grammar of our language and the vocabulary of our common speech are in the main still the vigorous Anglo-Saxon.

Related Articles. Consult the following titles for additional information:

England (history)
Language and Grammar
Language, Methods of Teaching
Literature, subhead English Literature
Philology

ENGLISH LITERATURE. See LITERATURE. Subhead *English Literature.*

ENGRAV'ING, the art of cutting characters or designs on a hard surface. This broad definition may include such examples as the figures cut on the rock walls of the prehistoric cave-dwellers; but in common usage the term is applied to the fine art of cutting designs upon metal plates or blocks of wood from which many impressions may be made. Sometimes the impression printed from this surface is called an engraving, but more properly it is designated a print.

The earliest engraving for the purpose of printing originated with the Chinese, who, as early as the tenth century, printed from wooden blocks. The art of printing from engraved plates of metal was discovered by an Italian in the fifteenth century, and by the middle of that century it was quite common in most of the countries of Europe. Some of the most celebrated artists of the fifteenth and sixteenth centuries reproduced their works by the use of engraved metal plates. In the latter part of the seventeenth century the art was introduced into England. Before photography was invented, engraving was about the only means of reproducing the works of artists. To-day except for special purposes, such as the printing of bank notes and fine copies of pictures, engraving is displayed by halftone printing and zinc etching.

A metal plate to be engraved must be free from scratches and must be highly polished. Over it is spread a thin layer of gummy substance called a *ground.* The ground is smoked, and the design to be engraved is transferred to it. At this stage the etching needle begins to work. It is passed over the entire design, leaving in its track a fine line of bright metal where the ground has been scratched off. A corroding acid is then poured over the plate to eat out the metal along the lines thus laid bare. A small instrument called a graver, or burin, is then used to complete the work of the acid. This is a short steel bar with a sharp, triangular point. When this tool is pushed along the surface of a metal plate with the axis of the bar slightly inclined to the plate, it plows up the metal in a curled shaving making a groove. The pressure upon it determines the size of the groove and the heaviness of the line that will be produced in the printing. The graver in going over the acid-bitten plate connects broken lines, strengthens weak ones and, with the aid of a burnisher, gives perfection and finish. Such is the process for landscape engraving.

In historical and portrait engraving of the highest class, the lines are first drawn on the metal with a fine point and are then entirely cut in by the graver. In soft-ground etching the ground is made by mixing lard with common etching ground and is laid on the plate and smoked as before, but its extreme softness renders it liable to injury. Therefore the outline of the subject is drawn on a piece of rough paper larger than the plate, the paper is dampened and laid gently over the ground, face upward, and the margins are folded over and pasted down on the back of the plate. When the paper is dry and taut a bridge or hand rest is laid across, and with a hard pencil the artist draws his design. The pressure makes the ground adhere to the back of the paper at all points touched by the pencil, and when the paper is lifted off, these parts of the ground are lifted with it. The corresponding parts of the plate thus left bare are subsequently exposed to the action of the acid. The irregular surface of the paper causes similar irregularities on the ground, and gives to the impression the character of a chalk drawing. The bitting-in is effected in the same manner as already described, and the subject is finished by rebiting and working with the graver.

Wood Engraving. Wood engravings are made on a slab of very hard wood, such as Turkish boxwood. The surface to be engraved is on the across-grain of the wood, and is made smooth with pumice and polished. Sometimes the design is drawn on the block, but more frequently it is transferred by means of photography.

The wood engraver's tools are delicate and are made of the finest steel. They are much like the wood carver's tools, and include gouges, chisels, dividers, in all sizes. If a slip of the knife is made, a hole is bored in the block where the tool slipped, and a plug of wood is inserted. Before the engraver begins cutting out the design, he gums a piece of paper over the sketch or photograph and tears out a hole over that part of the work where he begins engraving. The paper keeps the hand and fingers from smudging the drawing, and as the work progresses he enlarges the hole. After the job is finished a proof is taken under a hand press, and if it is satisfactory the woodcut is sent to the electrotyper, as the printing is not done from the woodcut, but from electrotypes of it.

Related Articles. Consult the following titles for additional information:

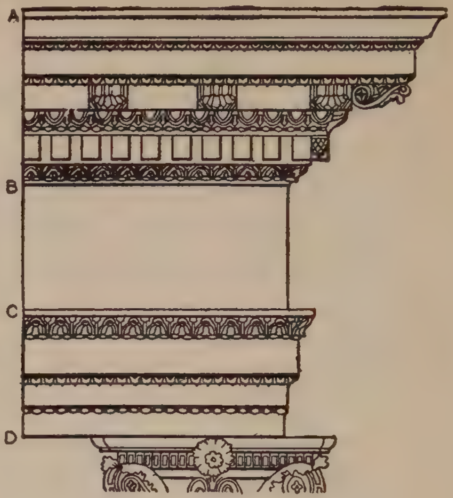
Aquatint
Electrotyping
Etching
Halftone
Printing
Zinc

E′NID, Okla., the county seat of Garfield County, fifty-five miles northwest of Guthrie, on the Frisco, the Santa Fé and the Chicago, Rock Island & Pacific railroads. The city is located in a fertile farming country, especially productive of wheat, poultry, eggs, butter and cream. In the last four products Enid leads all other parts of the country of equal area. Alfalfa is also a leading crop. There are excellent shipping facilities, and several wholesale houses conduct an extensive trade. There are large flour mills, a brick plant, manufactures of corn seeders, and ice, artificial stone, candy and other factories. The court house is a fine structure; in 1912 a new Federal building was erected. The city has Phillips University, Saint Francis Institute, a Carnegie Library and three hospitals. The commission form of government was adopted in 1909. The city dates from the opening of the Cherokee strip in 1893. Population, 1910, 13,799; in 1920, 16,576.

ENSIGN, *en′sine,* a term used with two different meanings. It signifies the flag of a nation, and is also the rank of the lowest commissioned officers in the United States navy. These are graduates of the Naval Academy at Annapolis, and correspond in rank to second-lieutenants of the army. The pay is $1,700 a year for the first five years, and an increase of ten per cent after the fifth year of service. Until 1871 the lowest commissioned officers in the British army were called ensigns.

ENSILAGE. See Silo and Silage.

ENTAB′LATURE, in classic architecture that part of a building which rests upon a row of columns. It consists of three principal divisions, the *architrave,* the part immediately above the column; the *frieze,* the central space, and the *cornice,* the upper projecting moldings. In large modern buildings, projections similar to, and known also as, entablatures are often carried round the whole edifice, or along the front of it. See Column; Parthenon.



ENTABLATURE

AB, cornice; BC, frieze; CD, architrave.

ENTERTAINING, Suggestions For. "What shall I do to entertain my guests?" This question presents itself frequently to large numbers of people; therefore, the following outlines ought to prove timely and helpful. These suggestions are of a varied nature; there is material for those whose guests enjoy competition in mental alertness, and for those whose guests prefer physical relaxation. A good many of the games can be modified, if it seems advisable, to adapt them particularly to individual needs.

Revealing Answers. One of the players goes out of the room and those remaining select the name of a well-known song. The person who is to guess this name is then called in and is told to ask the various players certain questions. Each answer must contain some word in the first line or the first stanza of the song. (This point depends upon the number of players, the length of the lines, and the preference of the players as to how difficult the game is to be made.) For example, suppose the song "Old Oaken Bucket" is selected. The answers must contain the words *heart, scenes, childhood,* etc.

Revealing Syllables. This is a variant of the preceding game. Each of the players is given one syllable out of a specified line, which he must sing to a selected tune. The syllables are all sung at the same time, and the one guessing the song must endeavor to distinguish them and to piece them together. If *America* is chosen, the players will all be singing together, but one will sing only *my,* another *coun,* another *try,* etc. The syllable may be sung in regular rotation, or otherwise, as the players prefer.

Descriptive Initials. Each of the following expressions suggests the name of an individual prominent within recent years. The initial letters of the words in any description are the initials of the person described. The hostess may write the descriptions on cards and pin one on each guest. The guests are then provided with slips of paper, and pencils, and directed to write down the names as they guess them. Have the cards numbered.

DESCRIPTION	KEY
1. Whales John Barleycorn	William Jennings Bryan
2. Found Cheating	Frederick Cook
3. Thoroughly Energetic	Thomas Edison
4. Made Fortunes	Marshall Field
5. Handles Flivvers	Henry Ford
6. Doesn't Love Germany	David Lloyd George
7. Evoked Pandemonium	Emmeline Pankhurst
8. Reached Pole	Robert Peary
9. Movie Princess	Mary Pickford
10. Justly Promoted	John Pershing
11. Nationally Rejected	Nicholas Romanoff
12. Thundering Reformer	Theodore Roosevelt
13. Greatest British Satirist	George Bernard Shaw
14. Explored Southward	Ernest Shackleton
15. Belabors Satan	"Billy" Sunday

Write a Telegram. This game calls for a number of telegraph blanks, if they can be obtained; of course, an ingenious hostess can easily make imitation ones. Each blank has written on it ten letters, and each player is directed to compose a telegram using words beginning with the letters. A prize may be given for the most original. For example, the person having the letters B S F S C T O R A H might write: "Burglars stole father's shoes; catch train or ride a horse."

Acting Charades. Competing sides are chosen and each side in turn acts out for the opponent a word of several syllables. The side which guesses the most words is declared the winner. For instance, if *mantel-piece* be chosen the first two syllables may be represented by someone who tells a story about a man. *Piece* can easily be acted out, and lastly the entire word. There are a large number of words that lend themselves to portrayal of this sort, and charades are excellent material for sharpening the wits. Some suggested words follow: Windlass, necromancer, children, Washington, silent, mistletoe, mendicant, handicap, inspiration, instrumental, laundress.

The charades which follow may be read aloud or be written on slips of paper and passed around to be guessed. They are not acting charades, as may be seen. Puzzles of this sort may be used to good advantage at a luncheon, before the guests leave the table.

Hidden Names of Flowers. Each of the following may be written on sheets of paper or, better, may be typewritten and passed to the guests for solution:

1. My first and second are each a lady's name,
My third an exclamation.
My fourth is a part of the human frame,
My whole a spring donation.

2. My first plus my second's a gift from the Lord,
And comes every day with the light.
My third plus my fourth is the victor's reward.
My whole goes to sleep every night.

3. My first enjoys the morning sun
And trills a song on high.
My second makes the horses run,
My whole is like the sky.

4. My first two form a lady's name,
Borne by queens well known to fame.
My third describes a metal rare,
Adorning many a lady fair.
My whole, a flower of yellow hue,
Opens its eyes in morning's dew.

5. In days of old my first came forth,
And preached on Jordan's shore.
In later days my last was used,
But now is used no more.
You'll find my whole a jolly fellow,
Dressed in a coat of brightest yellow.

KEY

1. An em o ne
2. Morning glory
3. Larkspur
4. Marigold
5. Jonquil

The Minister's Cat. A certain letter of the alphabet is selected and each player must think of an adjective beginning with that letter, to apply to the minister's cat. The players describe the animal in rotation, as follows: The minister's cat is a *little* cat; a *laughing* cat; a *lean* cat, etc. No word may be used more than once, and the winner is the one who can stay in the game longest, thus disclosing ability to name the greatest number of adjectives.

Geographical Game. The person starting the game uses a sentence containing some geographical word, as "I live in America." The next player must use a sentence containing a term beginning with the last letter in *America,* as "I crossed the Atlantic." The third player gives a sentence containing a word beginning with "C," and so on. No geographical term may be repeated, and those who make mistakes or cannot think of a term drop out of the game.

John Brown's Body. This is a nonsense game that is sure to create much laughter. The players sing in unison the chorus "John Brown's body lies a mould'ring in the grave." The first time they sing the four lines entire. The second time they sing all but the first word, *John;* instead of singing that word they nod the head. The next time they give two nods and begin with the word *body,* and so on through the song.

Old Mrs. McKinsey is Dead. This is another nonsense game. The first player says to his right-hand neighbor, "Old Mrs. McKinsey is dead." "How did she die?" asks the second player. "This way," and player number one waves his right hand back and forth. The answer and question go round the circle, and each player keeps his hand waving. Then number one begins again, and when asked how the old lady died, waves his left hand. This also goes round the circle. The third time the leader nods his head, the fourth time he shakes a foot, and so on. The game can be kept up as long as the players wish. After a number of rounds the players usually have to stop because they are exhausted with laughter.

Elementary Elocution. Each of the players is given a slip with the name of a Mother Goose jingle written on it. As their names are called each player mounts a chair and delivers, as dramatically as possible, the rhyme assigned him. This affords good opportunity for mock heroics and plenty of fun. Prizes may be given for cleverness of interpretation. A variant of this idea is to have familiar songs, especially comic ones, sung in grand opera style.

Acted Music. Those who possess phonographs can entertain their guests in a somewhat unusual way by having various selections acted out. Certain persons must be chosen beforehand and drilled. For example, someone may dress up as a grand opera *prima donna* and go through all the motions of singing while the phonograph is rendering the aria. Sousa's marches may be conducted by a person imitating the "March King." There are many other stars who can be represented.

A Dress-up Affair. This is a contest in getting into and out of garments quickly. Each of the guests brings with her a suitcase filled with a specified number of nondescript garments. The cases are passed around later, so that no one may know what the one given to her contains. At a given signal the cases are opened, and each player puts on, exactly in the order in which she touches them, the garments in the case. As soon as she has used them all she must take them off again, pack them in her suitcase, and close it. The one who finishes first is the winner. The ridiculous appearance of the players gives an added element of fun.

Who Am I? This is an excellent game to play when there is a large number of guests and the hostess wishes them to get acquainted with one another. A slip bearing the name of a noted person is pinned on the back of each guest, and as the guests circulate about they ask one another "Who am I?" The answers may suggest the names on the slips, but must not inform the questioners outright.

Miscellaneous Guessing Contests. A number of contests follow which will test the ingenuity of the players. The hostess in most cases should write out the exercises on slips of paper and have the guests write the answers. Prizes may be given for accuracy and originality.

A Missing Song Romance. Write out the following questions and leave blank space for the answers. As each question is read someone at the piano plays a strain of the song to be guessed. The title of the song in each case is the answer to the question.

1. What was the hero's name? *Ben Bolt.*
2. What was his sweetheart's name? *Annie Laurie.*
3. What made him become a soldier? *The Battle Cry of Freedom.*
4. For what did he offer his life? *America and Home Sweet Home.*

5. When did he come to say good by? *In the Gloaming.*
6. Who opened the door for him? *Old Black Joe.*
7. What did the heroine offer the hero? *The Vacant Chair.*
8. What did he bring her? *Flowers that Bloom in the Spring.*
9. How did her voice sound as she thanked him? *Sweet and Low.*
10. What did he say to her? *How Can I Leave Thee?*
11. What did she promise to do? *Keep the Home Fires Burning.*
12. What were her last words to him? *"Good By, My Lover, Good By."*
13. What kind of a watch did he promise to seek? *Watch on the Rhine.*
14. Where was he in a few weeks? *Tenting on the Old Camp Ground.*
15. When did he think of her? *Oft in the Stilly Night.*
16. What did he say when they asked him whom he was thinking about? *The Girl I Left Behind Me* and *Old Folks at Home.*
17. What did he sometimes sing? *Love's Old Sweet Song.*
18. What appeared on her head as she waited at home? *Silver Threads Among the Gold.*
19. What always floated over her home? *The Star-Spangled Banner.*
20. What was the motto of both? *The Stars and Stripes Forever!*

A Bouquet of Well-known Flowers. When Jack was a small boy his mother decided to educate him for the ministry, because, so she said, she wanted to see ..1.. some day. She was very strict with him, and when he was disobedient she punished him with a ..2... That used to make him ..3... Jack called his father ..4.. and his good-natured brother Bill he nicknamed ..5... His sister Sue he called ..6.. because she had such dark eyes. Jack's mother told him that if he wanted his health to be ..7.. he must get up at ..8.. in the morning. So when his father called ..9.. he always ..10.. at once. As Jack grew up his mother thought he ought to find him a wife. She said, "I hope you will not ..11..; I would rather see you ..12.. in..13.. with a poor girl."

One day Jack met a pretty maid named Rose, whom he loved at first sight. So he ..14.. to marry him. He said "..15.. me. I lay my ..16.. at your feet." But she was a ..17.. and she replied "..18.." But after he had asked her many a ..19.. she finally consented to be his ..20... That evening in her parlor they drew down the ..21.. and he kissed her ..22... When he went home each said to the other "..23.." They were soon married, and she urged him not to become a mere ..24.. of society. Some people ..25.. anything, but he remembered her words, and though he met many foreign belles he remained true to his ..26...

KEY

1. Jack-in-the-pulpit
2. Lady's slipper
3. Balsam
4. Poppy
5. Sweet William
6. Black-eyed Susan
7. Everlasting
8. Four-o'clock
9. Johnny-jump-up
10. Rose
11. Marigold
12. Livefor-ever
13. Sweet peas
14. Aster
15. Rosemary
16. Bleeding heart
17. Primrose
18. Touch-me-not
19. Thyme
20. Heartsease
21. Night-shades
22. Tulips
23. Forget-me-not
24. Dandelion
25. Lilac
26. American Beauty

Hidden Names of Birds. My son Bill came into the house one day looking very angry and so out of breath that he was ..1... "Why are you so..2..?" I said. "..3..rather see you happy." "Well," said Bill, "I was out by the brook sitting on a ..4.. and along came Ern Jones. 'Do your ..5..,' I said, 'and let's catch some fish.' So we sat down together, and after awhile we began to..6.. But I ..7.. if he didn't try to ..8.. all over me, telling me he was the ..9.. of the neighborhood, and it was a ..10.. to beat anyone. Now, I couldn't ..11.. all of his ..12.. and I told him he was ..13.. me of my just deserts. Ern is a ..14.. fellow and before I could ..15.. or ..16.. my head, he hit me. So we had a fight and here I am." When I had heard Bill's story I scratched my ..17.. for I have little ..18.. my head, and decided not to ..19.. for fighting. If a boy treated me that way I ..20.. him into the brook.

KEY

1. Puffin
2. Crossbill
3. Eider
4. Rail
5. Bittern
6. Chat
7. Swan
8. Crow
9. Kingfisher
10. Lark
11. Swallow
12. Raven
13. Robin
14. Swift
15. Tern
16. Duck
17. Baldpate
18. Heron
19. Whip-poor-will
20. Wood-duck

State Guessing Contest. In the following exercise the answer to each question is the abbreviation of one of the states of the Union:

1. What state has never married?
2. What state needs a physician?
3. What is the degree of that physician?

4. What state is useful in haying time?
5. What state is very exclamatory?
6. What state is busy on Mondays?
7. What state has a shelter in time of rain?
8. What state is dear to the Mohammedans?
9. What state can never be you?
10. What state is very pious?
11. What state never says "can't"?
12. What state uses the decimal system?
13. What state sells gold bricks?
14. What state could go out rowing?
15. What state is daddy to them all?

KEY

1. Miss.
2. Ill.
3. Md.
4. Mo.
5. O.
6. Wash.
7. Ark.
8. Ala.
9. Me.
10. Mass.
11. Kan.
12. Tenn.
13. Conn.
14. Ore.
15. Pa.

A Catechism on Authors. In each case the author's last name suggests the attribute applied to him:

1. What author is the most helpful?
2. What author is the best digger?
3. What author is the best shoe polisher?
4. What author hurts a man the most?
5. What author is the most aristocratic servant?
6. What author is the hottest?
7. What author is the best barrel maker?
8. What author is the sourest?
9. What author is the shrewdest?
10. What author is the most like our first ancestors?
11. What author is the healthiest?
12. What author is the most enduring?
13. What author is the heartiest?
14. What author is the best fisherman?
15. What author cries the hardest?
16. What author is the meekest?
17. What author is the tallest?
18. What author is the most foppish?
19. What author is the fairest?
20. What author is the most uncertain?
21. What author is the loudest?
22. What author suffers the most?
23. What author is the saintliest?
24. What author is the most bookish?
25. What two authors are farthest apart?
26. What author is the most scornful?
27. What author is the hardest?
28. What author is the strictest?
29. What author is most likely to win a race?
30. What author sews the best?
31. What author has the least repose?

KEY

1. George Ade
2. John Burroughs
3. Richard Blackmore
4. John Bunyan
5. Samuel Butler
6. Robert Burns
7. James Fenimore Cooper
8. George Crabbe
9. John Fox
10. Edward Gibbon
11. Edward E. Hale
12. Thomas Hardy
13. Bret Harte
14. Thomas Hooker
15. William Dean Howells
16. Charles Lamb
17. Henry W. Longfellow
18. Richard Lovelace
19. John Lyly
20. Hamilton Wright Mabie
21. Alfred Noyes
22. Thomas Paine
23. Alexander Pope
24. Charles Reade
25. Christopher North and Robert Southey
26. Bernard Shaw
27. Richard Steele
28. Lawrence Sterne
29. Jonathan Swift
30. Bayard Taylor
31. Oscar Wilde

Hidden Names of Authors. In each instance the name of the author is suggested in the text.

1. The places we should like best of all to be.
2. A precious metal and a worker in metal.
3. The seat of our affections.
4. The penalty for wearing shoes that pinch.
5. To agitate a weapon.
6. To injure and the opposite of high.
7. The man who takes your measure.
8. The things that languages are made of, and a man's character.
9. A name applied to prohibition advocates, and a refuge for wild beasts.
10. A lizardlike animal and a preposition.
11. A domestic animal and what it cannot do.
12. What the bread is doing in the oven.
13. A fuel and something under which it is often found.
14. A vehicle and a popular kind of hosiery.
15. The opposite of an old fellow.
16. What a boy asks for when he gets one piece of candy.

KEY

1. Holmes
2. Goldsmith
3. Harte
4. Bunyan
5. Shakespeare
6. Marlowe
7. Taylor
8. Wordsworth
9. Dryden
10. Newton
11. Cowper
12. Browning or Bacon
13. Coleridge
14. Carlyle
15. Newman
16. More

See What You Can Do With "X". In the following exercise, add a word in each case to the prefix "ex," and get a new word (partly phonetic):

1. Add a division of a play and get a synonym for "precise."
2. Add loose coins and get a form of barter.
3. Add an employe in a restaurant and get the treasury of a state.
4. Add a homesteader's land and get what he does when he sees it.
5. Add a telegram and get an edict of punishment from the Pope.
6. Add a small island and get a wanderer.
7. Add a pronoun and get a way out.
8. Add a few cents and get something that demands more cents.
9. Add a word meaning impudent and get a person of skill.
10. Add a coast city and get what is sent out of it.
11. Add a printing machine and get a swift train.
12. Add a camper's shelter and get the limit of that shelter.
13. Add nervous strain and get an addition.
14. Add the end of anything and get its destruction.
15. Add a self-propelled farm implement and get a man that pulls teeth.
16. Add a story of legendary fame and get the fate of many criminals.

KEY

1. Exact
2. Exchange
3. Exchequer
4. Exclaim
5. Excommunication
6. Exile
7. Exit
8. Expense
9. Expert
10. Export
11. Express
12. Extent
13. Extension
14. Extermination
15. Extractor
16. Extradition

Who Are These Kates? The answer in each case is a word ending in *cate.*

1. A Kate who will plead for you.
2. A Kate who embezzles.
3. A Kate who is often sick.
4. A Kate who sometimes puts her shoulder out of joint.
5. A Kate who has a double.
6. A Kate who knows how to teach.
7. A Kate who takes out stains.
8. A Kate who will help you out of difficulties.
9. A Kate who tells falsehoods.
10. A Kate who calls down Heaven's wrath upon you.
11. A Kate whose actions are very puzzling.
12. A Kate who prays with fervor.
13. A Kate who pours oil on squeaky hinges.
14. A Kate who chews her food well.
15. A Kate who makes predictions.
16. A Kate who was smothered.
17. A Kate who points out.
18. A Kate who left the premises.

KEY

1. Advocate
2. Defalcate
3. Delicate
4. Dislocate
5. Duplicate
6. Educate
7. Eradicate
8. Extricate
9. Fabricate (or Prevaricate)
10. Imprecate
11. Intricate
12. Supplicate
13. Lubricate
14. Masticate
15. Prognosticate
16. Suffocate
17. Indicate
18. Vacate

Naming the Nations. The answer in each case is a word ending in *nation.*

1. The nation that adopts one of two courses.
2. The nation that kills its public men.
3. The nation in which the different parties unite.
4. The nation that crowns its rulers.
5. The nation that is blessed with magic insight.
6. The nation that contributes gifts.
7. The nation that makes things clear.
8. The nation that chooses candidates for office.
9. The nation that installs clergymen.
10. The nation that is bankrupt.
11. The nation that is sluggish.
12. The nation that has no smallpox.

KEY

1. Alternation
2. Assassination
3. Combination
4. Coronation
5. Divination
6. Donation
7. Explanation
8. Nomination
9. Ordination
10. Ruination
11. Stagnation
12. Vaccination

Musical Mathematics. Subtract the last three letters from the names of well-known singers or composers and have left:

1. A vehicle.
2. An inhabitant of Heaven.
3. The opposite of near.
4. That which a river does.
5. That which a traveler does.
6. A pronoun applied to oneself.
7. A pronoun applied to all of us.
8. What an old-fashioned doctor uses.
9. What scandal does to one's reputation.
10. What a gossip's tongue does.

KEY

1. Car-uso
2. Cherub-ini
3. Far-rar
4. Flo-tow
5. Gad-ski
6. Me-lba
7. We-ber
8. Herb-ert
9. Sulli-van
10. Wag-ner

Subtract the first letter from familiar musical terms and have left:

1. A sweet-toned musical instrument.
2. A vast mob of soldiers.
3. An athletic contest.
4. An ancient vase.
5. A slang word for money.
6. A four-legged animal.
7. A strong liquor used by sailors.
8. The inmost part of an apple.
9. A skin irritation.
10. A swift means of traveling.
11. A source of water.
12. A small brook.
13. The opposite of new.
14. A child's toy.

KEY

1. S-harp
2. C-hord
3. B-race
4. T-urn
5. S-cale
6. B-ass
7. D-rum
8. S-core
9. P-itch
10. S-train
11. S-well
12. T-rill
13. H-old
14. S-top

Tree Guessing Contest. In this exercise the answer to each question is the name of a tree. The name in each case is suggested by the question:

1. What tree is a good harbor?
2. What tree is dear to Irish hearts?
3. What tree keeps all dressed up?
4. What tree is wasting away through grief?
5. What tree goes to fortune tellers?
6. What tree can make a horse laugh?
7. What tree can never be myself?
8. What tree is never younger?
9. What tree grows near the seashore?
10. What tree is opposed to prohibition?
11. What tree is feared by unruly boys?
12. What tree is the least handsome?
13. What tree wears a warm garment?
14. What tree is the father of the others?
15. What tree offers shelter in time of rain?
16. What tree likes to dance?
17. What tree scorns death?
18. What tree would be likely to bark?
19. What tree is the abode of angels?
20. What tree is the most tearful tree?

KEY

1. Bay
2. Evergreen
3. Spruce
4. Pine
5. Palm
6. Horse Chestnut
7. Yew
8. Elder
9. Beech
10. Bottle tree
11. Hickory
12. Plane tree
13. Fir
14. Pawpaw
15. Umbrella tree
16. Hop tree
17. Live oak
18. Dogwood
19. Paradise tree
20. Weeping willow

Adventures of Daffy Dilly. The blanks in this exercise are to be filled in with names of plants. The hostess should have the answers written on small cards, and give to each guest a set. The test is to make the right selections. The answers, if not arranged in regular order, may be placed where all can see them, if the hostess prefers.

1. What was Daffy Dilly? He was the son of ..1.. and..2. . .
2. Where did he go? He went on a journey to seek a good ..3. . .
3. What did he say as he started out? Farewell my ..4.. ..5. . .
4. What did he wear? ..6.., fastened with ..7. . .
5. What were on his feet? Pink ..8. . .
6. What did he carry for a staff? A ..9. . .
7. What kind of a hat did he wear? A ..10. . .
8. What emblem was waving in it? The American ..11. . .
9. What money did he carry? A ..12. . .
10. In what did he keep it? In a ..13. . .
11. What did he use to count it with? An ..14. . .
12. What sweets did he take for his lunch? . . .15 and 16. . . .
13. What did he use for a guide? A ..17. . .
14. How did he start off? With a ..18. . .
15. What was his parents' parting admonition? Don't ..19. . .
16. What was the first strange thing he saw? A cow with a ..20. . .
17. What did Dilly say? ..21. . .
18. What next did he see ? He saw the ..22.. and break a bone.
19. What did he say then? Can you ..23.. it?
20. Did he offer any assistance? Yes, he asked the cow if she would like to have her ..24. . .
21. What did the cow do? She shed ..25.. and became very angry.
22. Did Dilly laugh again? Yes and that made the cow still ..26. . .
23. What did the cow say then? She said, "Don't be ..27.. at me. I don't like your ..28. . ."
24. What did Dilly say? He said, "You can't ..29.. me."
25. What happened next? He saw a ..30.. coming down the path.
26. What did he say then? "..31.. part friends, oh cow, as I must be going."
27. What happened next? He went away in a ..32..ing hurry.
28. What did he do then? He went straight home to his ..33. . .
29. What did his father say when Dilly told his adventures? He said, "Don't ..34.. that. There is ..35.. as you for sowing ..36. . . Hereafter you will tend my ..37 .. of sheep.
30. What did Dilly say? He said, "All right ..38. . ."

KEY

1. Artichoke
2. Daisy fleabane
3. Thyme
4. Sage
5. Elders
6. Dutchman's breeches
7. Bachelor's buttons
8. Moccasins
9. Goldenrod
10. A bishop's cap
11. Flag
12. Pennyroyal
13. Shepherd's purse
14. Adder's tongue
15. Pieplant
16. Candytuft
17. Compass plant
18. Hop
19. Dodder
20. Goosefoot
21. Haw haw
22. Cowslip
23. Beet
24. Boneset
25. Job's tears
26. Madder
27. Pecan
28. Capers
29. Nettle
30. Dandelion
31. Lettuce
32. Tare
33. Poppy
34. Lilac
35. Nonesuch
36. Wild Oats
37. Phlox
38. Pawpaw

For children's sports, see GAMES.

ENTOMOL'OGY, that branch of zoölogy which treats of insects. See INSECTS.

EN'VELOPE, the paper cover enclosing a letter. Envelopes are so commonplace it seems strange that they have not been used for hundreds of years; but before 1840 they were unknown. Previous to that date a letter was folded so that a blank side served as a place for the address, and it was sealed with sealing wax.

Envelopes are made on specially-constructed machinery, and one modern machine will cut, fold, paste, print and box about 60,000 in a day. The usual sizes are known by numbers, as follows:

No. 4,	4⅛×4⅝	inches	No.	7,	3⅞×7½	inches
" 5,	3⅝X5½	"	"	9,	4⅛×9⅛	"
" 6,	3⅝×6½	"	"	10,	4⅛×9½	"
" 6¾,	3¾×6⅞	"				

ENVI'RONMENT, a general term used to indicate all the external conditions which affect the life and activity of an individual. It thus includes everything outside of self and is oftentimes used in distinction to the term *heredity,* or the influence which descends from parent to offspring. The environment of an individual is of two kinds, physical and social. The first includes the natural conditions of climate; topography; physical laws, such as gravity and those which produce light, darkness and sound, and the nature and extent of food supply. In the early stages of racial development physical environment is nearly all-important, and in view of this fact a certain group of scholars have emphasized the influence of natural economic conditions upon history, to the extent of declaring that this force is the most important of all influences upon the development of a race or nation. In advanced stages of civilization the social environment attains greater importance. By the use of the materials and conditions that nature throws about every race, customs, ideals and institutions are gradually developed, which soon become a determining influence in the life of the individuals that make up the races. Such are the institutions of family and state, customs and ideals of religion and industry. See HEREDITY.

ENVOY EXTRAORDINARY, a person dispatched from one country to another upon a special political or complimentary mission of unusual importance. An envoy extraordinary is sent by a ruler to represent the ruler and the state at the coronation or the funeral of another ruler; he is entrusted with a special diplomatic mission of delicate importance, for the time ranking the regular diplomatic representative from his country. His function ceases when he has discharged the single duty for which he was appointed.

Envoy Extraordinary and Minister Plenipotentiary, the grade of diplomatic representative next below that of ambassador (which see). Until 1896 the United States sent no representative abroad of higher rank, but in that year Germany, Great Britain, France and Italy each raised the rank of its diplomatic representative in America to that of ambassador, and the United States returned the compliment in kind. The envoy extraordinary and minister plenipotentiary represents his *country,* while the ambassador is the personal representative, as well, of the *ruler* of his country, a slightly more exalted station. The United States accredits about thirty diplomatists of this second highest rank to foreign countries, and a like number are accredited to the United States. The salary paid by America ranges from $10,000 to $12,000 per year, out of which the envoy must pay all his expenses. The rank next lower is that of minister resident. See DIPLOMACY.

EOCENE, *e′o seen,* **PERIOD,** a division of geologic time in the first part of the Cenozoic Era. In the United States the rocks formed during this period extend along the Atlantic coast and the Gulf of Mexico, up the Mississippi Valley to a point north of the Ohio. They also occur in some of the ranges of the Rocky Mountains. The rocks include marls, clays, sandstone and limestone. Nearly all the mammals existing to-day had become clearly defined by the end of this period. See GEOLOGY.

EPAMINONDAS, *e pam i non′das* (418?–362 B. C.), a Greek general and statesman. As a native of Thebes he feared the growing maritime power of the confederacy of Athens and equipped a fleet with which he captured several Athenian seaport towns. Four times as commander in chief of the Theban army he successfully invaded the Peloponnesus, or southern peninsula of Greece, when Thebes was threatened. His principal achievement was the overthrow of Sparta's power in the Peloponnesus and the establishment of Theban supremacy in Greece.

EPHESIANS, *e fe′zhanz,* **EPISTLE TO THE,** a letter addressed to the Christians at Ephesus by the Apostle Paul. It is supposed that it was written about the same time as the Epistles to the Colossians and Philemon, while Paul was imprisoned in Rome (see *Acts* XXVIII). The theme of the letter to the Ephesians is the ideal unity of the Church in Christ. It contains six chapters, the last of which contains the famous passage describing the armor of a Christian—the breastplate of righteousness, the shield of faith, the helmet of salvation, etc.

EPHESUS, *ef′e sus,* an ancient Greek city of Lydia, in Asia Minor, situated on the southern bank of the Cayster, near its mouth. Its fine harbor made it at one time the emporium of Western Asia. During the time of the Roman emperors it was especially prosperous. Several church councils were held here. Some interesting ruins have recently been excavated, including that of the great Temple of Diana (see DIANA, TEMPLE OF.) The site of the city is now a desolate waste.

EPHRAIM, *e′fra im,* the younger son of Joseph and the founder of one of the Twelve Tribes of Israel. This tribe was the most warlike in Israel. To it belonged Joshua and Samuel.

EP′IC, a narrative poem. Some authorities restrict the term to narrative poems written in a lofty style and describing the exploits of heroes. Others widen the difinition so as to include not only long narrative poems of romantic or supernatural adventure, but also those of a historical, legendary, mock-heroic or humorous character. The epic is distinguished from the drama by the fact that in the epic the author frequently speaks in his own person as narrator; and it is distinguished from lyrical poetry by its preponderance of action over emotion. Among the more famous epics of the world's literature are Homer's *Iliad* and *Odyssey,* Vergil's *Aeneid,* the German *Story of the Nibelungs,* the Anglo-Saxon poem of *Beowulf,* the French *Song of Roland,* Dante's *Divine Comedy* and Tasso's *Jerusalem Delivered.*

EPICTE′TUS (60–94), a Greek Stoic philosopher, born in Phrygia. He lived long at Rome, where in his youth he was a slave. Though nominally a Stoic, he was not interested in Stoicism as an intellectual system; he adopted its terminology and its moral doctrines, but in his discourses he appeared rather as a moral and religious teacher than a philosopher. See Stoicism.

EPICURUS, *ep i ku′rus* (342–270 B. C.), a Greek philosopher, founder of the Epicurean School, was born on the island of Samos. He settled at Athens in 307 B. C. and there, in a garden which he had bought for the purpose, established a school of philosophy. "Philosophers of the garden," his followers were called. Few of his writings survive. His indirect influence was great—the influence he exerted through other ancient writers. Plutarch, Cicero and Lucretius are the chief sources of our information concerning him.

Epicureanism, a system of philosophy founded by Epicurus. It was based on the principle that pleasure is the chief good. Those desires which can be fulfilled with the least effort or pain were thought to bring the most pleasure; and desire for enjoyment, except such cravings as do not lead to a calm mental state, was to be satisfied. The creed is not so simple nor is it as easily followed as at first appears; for the true Epicurean indulged in no pleasure which might lead to repentance. Epicurus and his friends led lives of temperance and simplicity. They valued knowledge only as it increased personal enjoyment. They believed that the soul and body died together; consequently they had no fear of death, since while the individual was alive, death was absent, and when death came, the individual was no more. They were bound by allegiance to no particular state or society, but believed in the absolute independence of the individual. The doctrines of Epicureanism were spread throughout Greece and were accepted by many of the prominent Romans. In modern usage the term *Epicurean* is applied to one who seeks pleasure for its own sake.

EPIDEMIC, *ep i dem′ik,* the general prevalence of a disease in a community. Most epidemics are due to the presence of disease germs. Malaria, typhoid, influenza, diphtheria, cholera, smallpox and bubonic plague are among the germ diseases which attack whole communities, each caused by a different germ. Most of them are carried about in the air, in drinking water or by insects. Malaria, which is caused by an animal parasite in the blood, is transmitted by the mosquito which sucks the blood of the malarial patient and, carrying the disease germs on its probocis, inoculates the next person it attacks. Thanks to medical and sanitary science, many communities once the prey of malaria epidemics have been rendered comparatively safe through the drainage of swamps and ponds and the destruction of other breeding places of the insect. Numerous epidemics of typhoid have been known to start with a polluted water supply. These have been checked by impressing upon the affected community the importance of boiling or filtering the drinking water.

In the cases of both malaria and typhoid the disease, which is due to local causes, is usually confined to a more or less restricted locality. A disease transmitted through the air we breathe, however, may have a vast range, for while the disease is in the early stages the patient may travel about and infect large numbers. The influenza epidemic which attacked the United States in the fall of 1918 was country-wide and was checked only after the most strenuous concerted effort and governmental regulations. Large indoor public gatherings were prohibited; dentists and barbers wore antiseptic masks at their work, and street-car companies were forced to ventilate their cars thoroughly.

Some germ diseases are contagious, that is, are transmitted from one person to another by actual physical contact, or may even be conveyed on clothing or in merchandise from one country to another. Smallpox is one of these, and terrible epidemics of it can be prevented only by general vaccination. In dealing with germ diseases an ounce of prevention is worth a pound of cure, whether the preventive measure consists in rendering people immune or in making their environment harmless. Bacteriology, though a comparatively new science, has done much to help man conquer these minute but powerful enemies—enough to inspire the hope that they may one day be altogether exterminated.

Related Articles. Accompanying the article Disease is a list of the human ailments treated in these volumes. For other information consult the following titles:

Bacteria and Bacteriology
Germ Theory of Disease
Medicine
Sanitary Science
Serum Therapy
Toxins

EPIDERMIS. See Skin.

EP′IGRAM, according to the modern meaning of the word, a short poem which, preferably at the end, gives a witty or ingenious turn to the thought. The name is also applied to any concise expression of a general fact. Among the Romans, Catullus and Martial were famous for their epigrams. In English literature, during the Age of Elizabeth, almost every writer of note wrote epigrams, and in a later period Pope especially excelled in this style of writing.

EPILEPSY, *ep′i lep si,* or **FALLING SICKNESS,** a disease of the nervous system, causing unconsciousness, either with or without convulsions. While epilepsy has been known for centuries, it is only within recent years that it has been scientifically studied. The location of the disease is generally considered to be in the gray matter of the brain.

There are many varieties of the disease, in some of which there are few outward signs of the attack, and the patient may not know that he has been unconscious. In one type of the disease the seizures always occur during sleep. In the ordinary epileptic fit, the person, after little or no warning, becomes suddenly unconscious and falls, foaming at the mouth. He may have violent convulsions, in which case he should be prevented from doing himself harm in any way. The seizures are often very alarming in appearance, but there is little or no danger, and they will pass away in from ten to twenty minutes, leaving the patient weak for some time. Nothing need be done except to loosen the neckbands and clothing about the chest, to lay the person down and slightly raise his head. Attempts to force conciousness to return are useless and may be injurious.

Few epileptics can be cured, but special attention to general health tends to decrease the number of attacks. Serious cases are best taken care of in colonies for epileptics. While the disease sometimes causes a gradual impairment of the mental powers, there are many epileptics who live long and useful lives.

EPIPHANY, *e pif′a ni,* a religious observance of the Roman Catholic, Anglican and Eastern churches. Formerly it commemorated the birth and baptism of Christ, but since 813 Epiphany has been observed in honor of the manifestation of the Infant Jesus to the *Magi,* who, guided by a star, went to Bethlehem to worship him. The date of Epiphany is January 6.

EPIPHYTES, *ep′i fites.* See AIR PLANTS.

EPIRUS, *e pi′rus,* in ancient times the country occupying the extreme northwestern part of Greece. The district has always played a passive part in history. It was occupied by independent tribes until the third century B. C., when King Pyrrhus unified it and gave it a temporary importance. In 168 B. C. it was conquered and annexed by the Romans; in the fourteenth and fifteenth centuries it passed back and forth between the Albanians and the Turks, and finally, in March, 1916, Greece took formal possession of it. Its ultimate fate was to be decided by the Peace Conference which began sessions in Paris in January, 1919 (see WORLD WAR).

EPISCOPAL, *e pis′ko pal,* **CHURCH,** or **PROTESTANT EPISCOPAL CHURCH,** a religious sect in America which separated from the Church of England (which see) in 1789, by adopting a constitution of its own. In belief and organization it differs little from the parent church. Since 1811 it has steadily grown, and in 1917 the membership was 1,000,000. The Church is governed by a general conference, which meets every three years. It is composed of the house of bishops, including all the bishops having jurisdiction in the United States, and the house of clerical and lay deputies, composed of four clergymen and four laymen from each diocese. Changes in the prayer book or constitution of the church can be made only by this body, and then only after proposed changes have been published in every diocese for a period of three years preceding the final action. Within the ranks of the Church, and organized for Christian service, are eighteen Sisterhoods, several orders of Deaconesses and the Brotherhood of Saint Andrew.

EPITAPH, *ep′i taf,* an inscription in honor of the dead, placed on a tomb, monument or other memorial. The term is also applied to literary tributes to the dead not intended to be inscribed on burial stones. The writing of epitaphs was practiced in ancient times by the Egyptians, Greeks and Romans, and several have come down from antiquity. Perhaps the most famous of these is the tribute of Simonides to the heroic band who died at Thermopylae:

Go tell the Spartans, thou that passeth by,
That here, obedient to their laws, we lie.

The collection of epitaphs of historic, literary or sentimental interest has resulted in the publication of a number of books on the subject. At the present time the epitaph usually seen on a gravestone consists of the name of the dead, the dates of birth and death, and a line or two of eulogy, or, perhaps, an extract from the Bible. In old-fashioned cemeteries, however, especially in English and colonial burial grounds, one finds many extraordinary memorials to the departed. One collector of epitaphs vouches for the following inscriptions on tombstones in English churchyards:

Some have children—some have none—
Here lies the mother of twenty-one.

Under this stone lieth the Broken Remains of Stephen Jones who had his leg cut off without the Consent of Wife or Friends on the 23rd October, 1842, in which day he died. Aged 31 years.

A young man of York whose sweetheart was drowned had these lines engraved on her headstone:

Nigh to the river Ouse, in York's fair city,
Unto this pretty maid death shew'd no pity;
As soon as she'd her pail with water fill'd
Came sudden death, and life like water spill'd.

An epitaph of genuine literary merit is Stevenson's *Requiem*, beginning "Under the wide and starry sky." It is engraved on his tomb on Mount Vaea, in the Samoan Islands.

E PLUR'IBUS UNUM, a Latin phrase meaning *out of many, one*, the national motto of the United States. It was suggested by Adams, Jefferson and Franklin, the committee appointed by Congress on July 4, 1776, to design a national seal. It has never been officially adopted, though it has been used continuously on coins.

EPOCH, *ep'ok*, an interval of time in the world's history marked by some extraordinary occurrence and for that reason distinguished from the rest of history and regarded as a milestone in the onward course of events. Such were the Age of Pericles, the Middle Ages and the Renaissance. Some epochs, based on astronomical time divisions, are used for convenience in a conventional division of history; thus, the eighteenth century, the nineteenth, the latter half of the nineteenth century, are distinct epochs.

EP'SOM SALTS, a variety of salts widely used as a laxative, in the manufacture of sulphates of sodium and potassium, as a fertilizer and as a coating for cotton cloth. It is composed of crystals of sulphate of magnesium, and is found native in some mineral springs, but is usually manufactured from magnesian limestone. It takes its name from Epsom, England, where it was first procured from mineral waters.

EP'WORTH LEAGUE, a religious society of the young people of the Methodist Episcopal Church, organized in 1889. In most churches there is a junior auxiliary, which holds services for the children on Sunday afternoons. An intermediate grade is sometimes included. The work of the League is divided into five branches—spiritual, missionary, mercy and help, literary and recreation, and civic betterment. Each of these departments is in charge of a vice-president. The other officers are the president, secretary, and treasurer. The League has a total membership of about 900,000, with branches in all countries where the Methodist Episcopal Church is established. The *Epworth Herald*, the League's official organ, is published in Chicago. Epworth is the town in England where John Wesley, founder of Methodism, was born.

EQUATOR, *e kwa'tor*, the great imaginary line circling the earth and dividing it into two equal parts called the northern and southern hemispheres. This circle is at all points 90° from the poles. Degrees of latitude are measured from the equator north or south along imaginary lines perpendicular to it and extending to the poles. All places on the equator have invariably equal days and nights. The *celestial equator* is an imaginary circle in space the plane of which is perpendicular to the axis of the earth. When the sun crosses the celestial equator, in spring and in autumn, the days and nights are of equal length. An irregular line encircling the globe and passing through points north and south of the equator is known as the *magnetic equator*. See DIPPING NEEDLE.

EQUINOCTIAL, *e quin ok'shal*, in astronomy, the circle in the heavens otherwise known as the celestial equator. When the sun is on the equator, there is equal length of day and night over all the earth; hence the name *equinoctial*. *Equinoctial gales* are storms which seem to be due to the sun's crossing the equator, occurring at the vernal and autumnal equinoxes, in March and September. There is no scientific basis for the belief that the sun's position causes these storms. *Equinoctial points* are the two points wherein the celestial equator and ecliptic intersect each other; the one, being in the first point of Aries, is called the *vernal* point; and the other, in the first point of Libra, the *autumnal* point. See PRECESSION OF THE EQUINOXES.

EQUI'NOX, the precise time when the sun enters one of the equinoctial points, or the first point of Aries about the 21st of March, and the first point of Libra about the 22d of September, making the day and night of equal length all over the world (see EQUINOCTIAL). At all other times the lengths of the day and of the night are unequal, their difference being the greater the more we approach either pole, while in the same latitude the difference is everywhere the same.

EQUISETUM, *ek wi se'tum.* See HORSETAIL RUSH.

EQUITY, *ek'wi ti,* signifies natural justice, or equality of rights. A court of equity is one in which justice is applied to remedy a civil wrong. A court of common law is limited strictly by the established principles of law, while a court of equity is conducted on a broader basis; it applies justice on proved merits of all aspects of a case. In many cases no specific statute applies, but when decisions bearing on such cases are recorded they become standards for courts to follow in the future. See LAW, and references there given.

ERA OF GOOD FEELING, the term applied to the period of American history between 1817 and 1824, when there was virtually only one political party in the United States—the Democratic-Republican. Although President Monroe's reëlection by an electoral vote of 231 out of 232 indicated little party opposition, the times were not without internal party strife among the various factions, and some of the bitterest contests in American history were taking place in Congress. See MONROE, JAMES.

ERAS'MUS, DESIDERUS (1467–1536), one of the greatest scholars of the Renaissance period. He was educated for the priesthood and took orders, but spent his life as an independent scholar, living by his pen. He lived chiefly at Paris, Louvain, in England and at Basel. For a short period he was an assistant in Greek at Cambridge University. In scholarly attainments he was the foremost man of his age. He is thought of as a precursor of the Reformation, yet he was opposed to Luther and Calvin, and remained throughout his life a Catholic. He shunned extreme views and believed in the slow reform resulting from the spread of education. Soon after the printing press was invented he published a Greek Testament and numerous works of classical authors in Greek and Latin. His own writings, in Latin, the regular medium of written communication at the time, are modern in style and have a charm and an individuality which are a true expression of the man's character.

EREBUS, *er'e bus,* in Greek mythology, the son of Chaos. His domain was a lower world, named for him, beneath the earth's surface, through which the shades (spirits of the dead) passed on their way to Hades. His sister, Nyx, was the goddess of night.

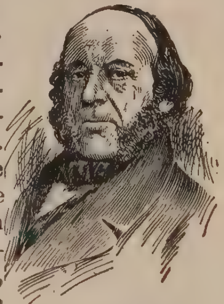
ERECTHEUM, *e rek'the um,* an ancient Greek temple, built in the fifth century B. C. It was the sanctuary of Erectheus, the Athenian god of architecture, and of the goddess Athena. The plan embraced a large room seventy-four by thirty-seven feet, flanked on three sides by porticoes. Of these only the floors, columns and fragments of the entablature remain, but even in decay it is one of the noblest monuments of antiquity. The columns of the east and north porticoes are the finest remains of Ionic architecture in existence. The south portico, known as Caryatides, or Porch of the Maidens, is famous for its six beautifully-sculptured female figures which uphold the entablature. See CARYATIDES.

ERFURT, *er'foort,* GERMANY, a city in the Prussian province of Saxony, on the Gera River, fourteen miles west of Weimar. Erfurt is the center of the flower seed industry in Germany, and in this field it is perhaps the first city in the world. It has a fine cathedral, dating from the thirteenth century, and several handsome Gothic churches. The university, founded in 1378 and suppressed in 1816, was long an important institution. There are still a royal academy of science and a royal library with 60,000 volumes. The monastery (now an orphanage) was the residence of Luther from 1501 to 1508. The manufactures are varied, including clothing, machinery, leather, shoes, ironmongery and chemicals. Erfurt was one of the most important commercial towns of Central Germany in the Middle Ages. Population, 1919, 129,646.

ERGOT, *ur′got,* the altered seed of rye and other grasses, the change being caused by the attack of a fungus. The seed is replaced by a dense close-grained tissue largely charged with an oily fluid. Ergot is poisonous, and exerts a powerful action on the heart. It should never be used as a medicine except as prescribed by a reliable physician. As ergot is occasionally used for illegal purposes, its sale except on the prescription of a physician is prohibited by law.

ERGOT OF RYE

ER′ICSSON, John (1803–1889), a famous engineer, born in Sweden. He served for a time in the Swedish army, removed to London in 1826 and later to New York. He is identified with numerous inventions and improvements on steam machinery and its applications. His chief inventions are his caloric engine, the screw propeller, which has revolutionized navigation, and his turret ships, the first of which, the *Monitor,* distinguished itself in the American Civil War and inaugurated a new era in naval warfare. In his later years he attempted to perfect the solar engine. See Monitor and Merrimac.


JOHN ERICSSON

ERIC, *er′ik,* **THE RED** (950?–1000), a Norwegian navigator and explorer. An accusation of murder drove him from his native country to Iceland. There he was again accused of homicide and forced to flee. He sailed west and came upon an uninhabited country, which he named Greenland and conceived the idea of colonizing it. Accordingly he returned to Norway and organized a band of colonists. On the way many perished; the others soon died.

Leif Ericson, son of Eric, introduced Christianity into Greenland and, according to some historians, later discovered North America.

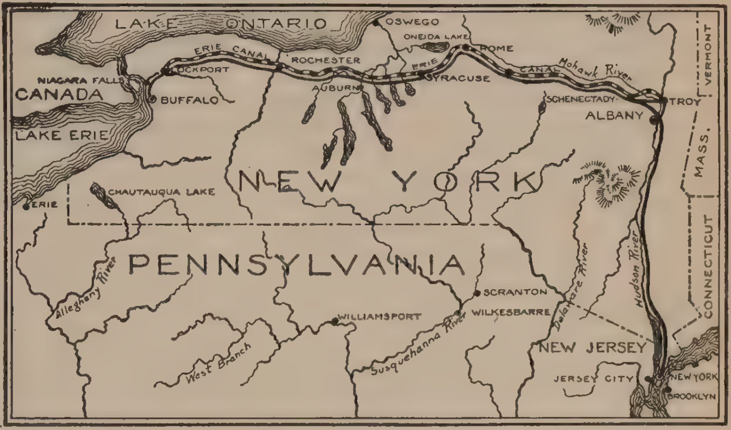
ERIE, Battle of Lake, an important naval battle of the War of 1812, fought on Lake Erie, September 10, 1813, between a squadron of nine small vessels, under Commodore Perry of the United States navy, and one of six vessels, under Commodore Barclay of the British navy. The *Lawrence* was Commodore Perry's flagship, and for two hours it bore the brunt of a terrible battle. When it was almost a total wreck, Perry, with his crew of eight who survived, left the vessel and crossed in a small rowboat, under the concentrated fire of the British fleet, to the *Niagara,* where he again raised his pennant. Bringing the rest of the American fleet into close action, within ten minutes he compelled the British to strike their colors. Then he sent the famous message to the government officials, "We have met the enemy and they are ours." See War of 1812.

ERIE, Lake, the smallest and shallowest of the Great Lakes of North America, excepting Lake Saint Clair. Lake Erie lies between lakes Huron and Ontario, with which connection is made at its western end by Saint Clair River, Lake Saint Clair and Detroit River, and by Niagara River and the Welland Canal (which see) at its eastern end. Its area is 9,960 square miles, a little greater than that of Vermont. Its surface is 573 feet above sea level and its greatest depth is 200 feet. The surface of Erie is eight feet below that of Lake Huron, but it is 326 feet higher than the surface of Lake Ontario. It is 240 miles long; the greatest width is forty miles.

Slightly over half of this lake belongs to Canada. There are no towns of importance on the Canadian shore, but on the Ohio shore are the large cities of Toledo, Cleveland and Buffalo, while the smaller cities of Sandusky, Ashtabula, Conneaut and Erie are of more than local note. Because of the shallowness of the lake, storms lash its waters into violent seas. See Great Lakes. for chart of comparisions.

ERIE, Pa., the county seat of Erie County, nearly 100 miles northeast of Cleveland, Ohio, on Lake Erie, is the only lake port of the state; and it is also an important railroad center, being on the Lake Shore & Michigan Southern (New York Central), the Philadelphia & Erie, the Erie & Pittsburgh, the New York, Chicago & Saint Louis, the Bessemer & Lake Erie and the Pennsylvania railroads. A supply of natural gas, proximity to coal and coke fields and fine shipping facilities make the city an important manufacturing center. The industries are over 450 in number and include great boiler and engine works, iron works, foundries, machine shops, refineries, chemical works, shipyards, flour mills and piano and organ factories.

On Garrison Hill, opposite the entrance to the harbor, is located the state soldiers' and sailors' home. Erie has a fine government building, containing the post office, the internal revenue and customs offices, the signal service station and the district court rooms. The public library is a part of the public school system; there are two hospitals and eight homes for children and the aged. The city has numerous buildings eight to twelve stories in height. The commission form of government was adopted in 1913.



MAP OF ERIE CANAL AND NEW YORK CENTRAL RAILROAD

Note how railways later paralleled the canal.

The land-locked harbor is protected by Presque Isle, a peninsula six miles long and a mile wide. A fort of this name was built on the site of the present city in 1753. The settlement was laid out in 1795 and was chartered as a city in 1851. Gen. Anthony Wayne died here in 1796, and the state has erected a memorial in the form of a blockhouse. The fleet of Commodore Perry was built and equipped at Erie. Population, 1910, 66,525; in 1920, 93,372.

ERIE CANAL, a canal in New York state extending from Buffalo to Troy and Albany, connecting Lake Erie with the Hudson River. It is the oldest and most important section of the canal system known as the New York State Barge Canal. The Erie Canal was the first artificial waterway of importance constructed in the United States. Begun in 1817 and completed in 1825, it was a monument to the untiring efforts of De Witt Clinton, governor of New York during most of the time it was under construction. It was built by the state at a cost of $7,602,000, and its completion marked a new era in the commercial expansion, not only of New York, but of the country. The industrial and financial supremacy of New York City was based on the successful operation of this canal more than any other single factor.

When the canal was first opened to navigation it was 363 miles long, twenty-eight feet wide at the bottom, forty-two feet wide at the top and four feet deep. By 1835 it had become inadequate for the increasing amount of traffic on it, and an enlargement was then authorized. In the course of the next few years a number of improvements were made, and by 1862 the canal was seven feet deep, fifty-two feet wide at bottom and seventy feet wide at the surface. After the Civil War it was somewhat neglected for a number of years because of railroad competition, but interest in navigable waterways was revived late in the nineteenth century, and in 1903 the state of New York, by popular vote, ratified a great bond issue for a thorough reconstruction of the canals of the state. See NEW YORK STATE BARGE CANAL.

E'RIS, in Greek mythology, the goddess of discord, sister of the war god Mars. Legend has it that Eris, indignant that she was not invited to the marriage festivities of Peleus and Thetis, threw into the midst of the assembled guests a golden apple, on which was inscribed, "For the fairest of the fair." Because of the jealous rivalry for its possession, it has ever since been known as the "apple of discord."

ERMINE, *ur′min,* or **STOAT,** *stote,* a name given to any weasel whose fur, short, soft and silky, turns white in winter. In winter it changes from a reddish brown to a yellowish white, and in intense cold to pure white. The tip of the tail is always black. The beauty of the fur makes it valuable for commerce. The ermine is difficult to capture. Most traps are useless, as the fur is injured in the animal's efforts to free itself. An ingenius device used to entrap it is a greased hunting-knife, placed in the snow to lure by its resemblance to ice, which the thirsty little creature seldom fails to lick. The intense cold causes the tongue to stick to the metal surface, where it is held fast.

Ermine is used for muffs, stoles, coat linings and trimmings. It has long been an emblem of royalty, and from time to time the black tips have been conspicuous figures in heraldry. See FUR AND FUR TRADE.

EROSION, *e ro′zhun,* the wearing away of parts of the earth's surface through natural causes. The principal agents of erosion are rain, running water, waves, ice and the atmosphere.

Rain and Running Water. Rain water contains ammonia, carbonic acid and frequently small quantities of muriatic and nitric acids. These substances decompose some of the rocks on which the rain falls. When rain strikes the earth a portion of it soaks into the soil and penetrates to some distance beneath the surface. This water collects in cavities in various strata, and some of it reappears in springs. Another portion runs down the slopes, carrying with it more or less of the soil, dust and particles of decomposed rocks and depositing these on lower levels.

THE GRAND CANYON OF THE COLORADO RIVER

An example of the work done by erosion.

The different degrees of hardness at various points on the surface of slopes, as well as their original unevenness, cause the water to flow down them in rills and rivulets. Each of these cuts a channel for itself. Thus the slopes are made still more uneven by running water, and it is in this way that hillsides are sculptured in such a variety of forms. The deep valleys between the plateaus are excavated in the same way (see CANYON). The main stream in a valley also wears away more or less of the valley floor. A large stream like the Mississippi, flowing through a region of loose rock, will form a wide valley with broad, gentle slopes, but wherever the current is swift, the stream may have its channel defined by abrupt banks, which are usually low and contain here and there high bluffs. See VALLEY.

Waves. Waves are confined in their action to the shore line, but along the seacoast, wherever breakers occur, they are continually wearing away the rock. Waves also carry out with the undertow more or less sand and gravel from the beach. Thus the shore line is gradually extending. Similar effects are produced on large bodies of fresh water like Lake Superior, but they are not so distinctly marked nor so extensive.

Ice. Ice acts principally by breaking and crumbling rocks through the freezing of water. This so disintegrates the rock that particles of it are easily carried away by water. Wherever glaciers exist, their movement is attended with erosion, as well as transportation of material (see GLACIERS).

Atmosphere. The atmosphere works both by mechanical and chemical action. The oxygen, carbon dioxide, water vapor and other substances found in the atmosphere tend to decompose rocks and form new compounds. In the arid regions the wind wears away rocks in certain localities and denudes those in others. Much of the sculpturing in the Rocky Mountain regions is due to this cause.

ERRAT′ICS, or **ERRATIC BLOCKS,** in geology, boulders, or large masses of angular rock in an alien environment, having been transported from their parent mountains by the action of ice during the glacial period. Thus, on the slopes of the Jura Mountains immense blocks of granite are found, which have traveled sixty miles from their original location. Similarly, masses are found in numerous places in the United States. See BOULDER.

ERYSIPELAS, *er i sip′e las,* a very infectious disease, which is sometimes an epidemic in hospitals, especially military hospitals in time of war. It is not, however, a purely hospital disease, but may affect any persons who have been exposed to the contagion. It usually appears upon the head or face, in the form of an inflammation of the skin, accompanied by swelling and pain, and may terminate in fever and delirium.

Erysipelas is caused by germs which make their way into the skin by way of a cut or a scratch. Treatment consists in applying antiseptic dressings to the inflamed parts and administering tonics to the patient.

ERZERUM, or **ERZEROUM**, *er z′room′,* a city of Turkish Armenia, capital of the province of the same name. The town is about 6,000 feet above sea level, forms an important strategical center and has become a principal frontier fortress. In addition to important manufactures, especially in copper and iron, it carries on an extensive trade and is a chief halting place for Persian pilgrims on their way to Mecca. In February, 1916, Erzerum was captured by the Russians after a brilliant attack, but in 1918, after the collapse of Russia, it was taken by the Turks (see WORLD WAR). Population, about 40,000.

E′SAU, the eldest son of Isaac and twin brother of Jacob. The story of his loss of birthright through the craft of Rebekah and Jacob and of his quarrel and reconcilation with Jacob is told in these volumes under the subhead *Bible Stories,* in the article BIBLE.

ESCANABA, *es ka naw′ba,* MICH., the county seat of Delta County, on Little Bay, seventy-three miles south of Marquette, on the Chicago & North Western, the Minneapolis, Saint Paul & Sault Sainte Marie and the Escanaba & Lake Superior railroads. It has a good harbor, and is one of the most important shipping points for the Lake Superior iron region. There are eight iron-ore docks. The city and vicinity offer good fishing and boating. The city has an ore-crushing plant, furniture and woodenware factories and railroad repair shops. It was first settled in 1863 by employes of a railway company and became a city in 1883. Population in 1910 was 13,194; in 1920, 13,103, a slight decrease.

ESCO′RIAL, *or* **ESCU′RIAL**, a remarkable building in Spain, near Madrid, comprising a palace, a convent, a monastery, a church and a mausoleum. It was built by Philip II between 1563 and 1584 and was dedicated to Saint Lawrence, in commemoration of a military victory won on the festival of the saint, in 1557. It is built on the plan of a gridiron, because Saint Lawrence is said to have been roasted alive on one. The church, the finest part of the whole building, is richly decorated and contains a crypt, or royal tomb, in which are buried all but two of the kings of Spain since Charles V. The dome is sixty feet in diameter, and its height at the center is about 320 feet. The library contains a valuable collection of some 30,000 books and manuscripts. The principal entrance to the palace is opened but twice during each reign, once to admit the king on his first visit to the place, and a second time when his dead body is carried through. Fire and lightning have frequently damaged the Escurial, but it has repeatedly been repaired, so that it represents to-day an expenditure of $10,000,000.

ESCROW, *es kro′,* in law, an instrument in writing, under seal, held in the possession of a third party until certain conditions between the two parties signing it have been fulfilled. The document while in the hands of the third party does not operate as a deed or conveyance; it simply holds the property stationary as a guarantee of fulfillment of obligations. The deposit of the escrow places the described goods or land beyond the control of the grantor, and they are delivered to the grantee as soon as he has met the stipulated conditions.

ES′DRAS, BOOKS OF, certain books of that portion of the Old Testament known as *Apocrypha.* They are generally divided into the *First Book of Esdras* and the *Second Book of Esdras.* As ordinarily considered, the first book includes the book of *Ezra,* a portion of *Nehemiah* and the last two chapters of *II Chronicles.* The second book consists of the revelation of Esdras and somewhat resembles in its nature the book of *Revelation.* It consists of a series of visions regarding the mysteries of the moral world and the final triumph of righteousness. The descriptions are striking, and the language is sublime. See APOCRYPHA.

ES'KIMO, an interesting race of people inhabiting parts of the Arctic regions through an east-and-west range of 3,000 miles. They call themselves *Innuits,* a word meaning *the people;* the word *Eskimo* is an Indian term which means *eaters of raw flesh.*

Description and Habits. These people are short in stature (about five feet two inches) and, as a rule, are rather fleshy, but not fat. Their faces are wide and oval; their noses are flat, their hair jet-black and straight. Their complexion is naturally light-brown, but they usually appear darker, for the Eskimo are seldom clean. More civilized people criticize them for their uncleanly habits, yet the most fastidious in like environment might in even a generation or two acquire many of the faults of these little people in the dreary wastes of the northland. Their winter homes are *igloos* of snow; sometimes in the very short summer in some parts they acquire huts of driftwood and skins. Bathing has been practically unknown; there has been almost entire lack of facilities. American school teachers are succeeding a little in remedying this defect.

Contrasted with their unclean habits, they possess attributes which more civilized peoples often lack. The Eskimo never takes what belongs to another; the only government is that of the family, for they need no complex systems of control. Common ownership of the products of the hunt is the rule in many localities.

The Igloo. The winter home of the Eskimo has a side wall of driftwood and stone, rounded at the top and made airtight by moss and finally banked over the entire surface with snow. Sometimes only blocks of ice and snow are used in building. Entrance is through an opening so small that inmates are obliged to crawl in and out on the hands and knees. The heating and lighting plant of the igloo is a sort of lamp, made frequently of soapstone, hollowed out like a shell. This is filled with whale blubber for oil, and the wick is of dried moss. This lamp provides enough heat to the solidly-built igloo to insure what the Eskimo consider a comfortable temperature. Skins line the igloo to keep dripping water from the inmates. An igloo is sometimes large enough to accommodate fifty people.

The Eskimo's Food. These little people live on a principal diet of fats and oils; in winter they must have heat-producing foods almost exclusively. During the coldest months they eat the fat meat of seals and whales; in summer they travel long distances sometimes to find deer, bears, rabbits and foxes. Fish are also caught in summer. Some of this meat is usually packed away for winter, to provide variety in the menu. Often it is placed in layers on the floor and covered with skins; in the cold months, then, they begin to eat their floor, and reach the ground by spring! Within recent years thousands of reindeer in Alaska, the first few hundred being brought there by the Bureau of Education, have furnished meat in increasing quantities.

Their Clothing. The dress of men and women differs little. Everybody wears trousers, boots and a jacket with a warm hood which can be pulled over the head, nearly enveloping it. The women's boots are higher than those of the men. Women carry their infant children in special hoods. Clothing is almost entirely of furs, excepting along the coasts, where white people induce the natives to buy coarse, heavy cloth, which is, however, less desirable in the intense cold of winter.

Mode of Travel. For many generations the Eskimo dog has been the beast of burden. These dogs, trained and hardened to endure great privation when necessary, hitched from six to ten in tandem to a sledge, can run sixty miles a day. The reindeer, referred to above, by thousands are found now in Western and Southwestern Alaska; they are adapted to the work of the natives, who also eat their flesh and make clothing of their skins.

On the water the male Eskimo row swiftly in a peculiar boat known as a *kayak,* which is a fishing boat; the *umiak,* or family boat, is used by the women. The *kayak* is very light, from ten to twenty feet in length and less than two feet in width, and is made of skins stretched over ribs of bone or wood. It is entirely covered, with the exception of a small opening large enough to receive the body of the oarsman. The *úmiak,* made of the same material as the *kayak*, is large enough to hold a family and the few household goods.

Their Occupations and Education. Eskimos live in "the great white silence." Their lives must run along simple lines. The man must always hunt and fish, to supply the great amount of food needed in the cold climate. Wherever white men are encountered they have become tradesmen, selling skins, whalebone and eiderdown; the most important article received in exchange is the rifle; with the coast natives it has succeeded to some extent the spear and harpoon, the natural and primitive weapons of the hunt. The women do all the remainder of the work.

All the people like to play. They race, play a game resembling football, engage in card playing, wrestling and the like. The children have their toboggans, they play hockey, and they "play horse" as do white children, though their fancied horses are dogs, for they never have seen a horse.

The Eskimo are decreasing in number, and now there are few more than 30,000 of them. They are comparatively short-lived, due to unhygienic manner of living and to the introduction of contagious diseases brought by white people. The United States government, through numerous schools, whose teachers are heroic in their isolation, is teaching them how to live, and is meeting with encouraging support from the natives. In many communities there is already evidence of the acceptance of customs and practices of the whites.

ESPAR'TO, a grass growing in Spain and North Africa, long used in the manufacture of cordage, matting and similar articles, and now extensively employed in paper making. It grows to a height of three or four feet, and bears gray-green leaves which sometimes grow to be three feet in length.

ESPERANTO, an artificial language created by Dr. Zamenhof of Warsaw, who, under the assumed name of *Dr. Esperanto*, published his first pamphlet upon the subject in 1887. From this the language takes its name. Esperanto is claimed to be the best attempt so far to produce an international language. The vocabulary is formed by selecting first the root words which are common to all the principal European languages; second, those that are common to all but one; then those that are common to all but two, and so on. The grammar is regular and very simple. By means of an elaborate system of prefixes and suffixes the vocabulary is given an almost unlimited extension; thus, *bona* means good, *malbona*, bad; *fermi* means close, *malfermi*, open. The suffix *in* denotes feminine; *knabo* means boy, *knabino*, girl. Several books have been published in Esperanto. Other languages competing with Esperanto for place as an international language are Volapuk, Ido, Neutral and Bolak.

ESQUIMALT, *es'ke mo*, BRITISH COLUMBIA, on Vancouver Island, three miles from Victoria. Esquimalt has a fine harbor, naval yards and fortifications and a large dry dock. Shipbuilding and salmon canning are the principal industries. Population, 1921, 6,484.

ES'SAY, a written composition on some special subject. Essay writing is an important part of the language work of English courses from the lower grades through high school. The younger pupils are learning to write essays when they are asked by their teacher to write out a description of their favorite animal pet or to tell which one of their studies they enjoy most, and why. Later in school life they are given more difficult subjects, such as book reviews, discussions of current events, or descriptions of scenery.

No matter what the subject of the essay may be, it must contain the opinions of the writer on that subject. It may be in the form of description, a discussion or an argument, or it may be on a wide variety of subjects—history, politics, science, literature, religion, sociology, etc. Essays should be carefully planned and have an orderly arrangement. It is a good idea to make an outline before one starts to write, if the essay is to be of considerable length. Suggestions along this line will be found in these volumes under the heading THEMES, OUTLINES FOR.

In literature the essay has had an important place since the time of Montaigne (1533–1592). He was a French author who wrote a series of delightful essays of an informal character. In English literature there is a body of essay writings of permanent value. Important works in this field include the essays by Steele and Addison contained in the *Tatler* and the *Spectator;* Bacon's *On Studies;* the *Essays of Elia*, by Charles Lamb; Macaulay's *Milton;* Carlyle's *Burns;* the essays contained in Ruskin's *Sesame and Lilies;* and numerous others by such writers as Newman, Hazlitt, De Quincey, Stevenson, Benson, Chesterton, Shaw and Wells. In American literature the essay form was successfully handled by Irving, Emerson, Lowell, Holmes, Thoreau, Curtis, Howells, Mabie, Crothers, Agnes Repplier and others.

Related Articles. The following list contains the names of the more important essayists whose biographies are found in these volumes:

Addison, Joseph
Bacon, Francis
Burroughs, John
Carlyle, Thomas
Chesterton, Gilbert K.
De Quincey, Thomas
Emerson, Ralph W.
Goldsmith, Oliver
Holmes, Oliver W.
Howells, William D.
Irving, Washington
Lamb, Charles
Lowell, James R.
Mabie, Hamilton W.
Macauley, Thomas B.
Montaigne, Michel
Newman, John H.
Ruskin, John
Shaw, George Bernard
Stevenson, Robert L.
Thoreau, Henry D.
Wells, Herbert G.

ES'SEN, Germany, a town of Rhenish Prussia, eighteen miles northeast of Düsseldorf, noted during the last quarter century as the most important center of munitions making in Germany, and as one of the greatest in the world. Here is located the great Krupp industrial establishment, which has hundreds of branches in various parts of Europe (see Krupp, Friedrich Alfred). The town is an old one, and its beautiful cathedral dates from 873. Its industrial development, however, is of comparatively recent date. In 1850 its population was about 9,000. In 1919 it was 439,257 (census).

ESTATE', the interest which a landholder possesses in his land. The term arises from the fact that under the old feudal system the ownership of all land was vested in the king, and all private holders of land were his tenants. The interest of such a tenant was called his *estate,* and this was always less than absolute ownership. Thus various classes of tenancies or estates were developed, and these persist in law to the present time. Of these estates three are called *freeholds.* They are the *fee simple,* that is, the right to dispose of land in any way, which suits the possessor, who is in absolute ownership; the *fee tail,* which gives the possessor the right to dispose of his land only to his own issue, and the *life estate,* which gives the possessor the right to control the land only for the space of his lifetime. The estates which are not freeholds are various forms of tenancies, the difference usually being in the period over which the contract extends, whether for years, for life, from year to year, terminable at the will of either party or at the sufferance of the so-called owner of the land. See Real Property.

ESTHER, *es'tur,* a Jewess maid who became queen of Persia. Her story is told in these volumes in the article Bible, subhead *Bible Stories.*

Book of Esther, the last of the historical books of the Old Testament. It takes its name from the Jewish maiden whose history it gives. The book is written in Hebrew, with many Persian words, which seems to prove that its date was during the Persian rule in the reign of Artaxerxes, 465–425 B. C. The word *God* does not occur in the text; neither is the book alluded to or quoted in the New Testament, and with the exception of Esther's fast no religious act is spoken of. The Jews of to-day, however, celebrate the feast of Purim in token of the deliverance of their people through Esther's aid.

ESTHETICS, *es thet'iks,* a word derived from the Greek, meaning *perceptive,* and applied to that branch of philosophy which concerns itself with the beautiful in nature and in art. It was first used in this sense by Hegel, early in the nineteenth century; prior to that time there had been various theories of the beautiful. The German philosopher Baumgarten believed that the mind possesses a special beauty sense, or faculty of appreciation, and that this was not an intellectual gift, though dependent on the intellect. The idea of beauty, as has been pointed out, is "not positive, but depends upon individual taste;" hence the wide diversity in the product of artistic effort. Although there is no ultimate criterion of beauty, every work of art must observe certain fixed laws of beauty; and whether the artist belongs to the school which finds its highest expression in trying to imitate nature, or to the cult which regards art as independent of nature, he must not, if he wishes to be taken seriously, depart too far from established rules.

ESTHO'NIA, one of the Baltic provinces of the Russia before 1918. It lies on the east coast of the Baltic Sea, in about the latitude of Petrograd. The Gulf of Finland separates Esthonia from Finland on the north, and Livonia lies directly south. The area, by treaty, is 23,160 square miles, and the population (1920) 1,750,000. Revel, the capital, is a fortified seaport. The Esthonians are related to the Finns, and under the old Russian régime they steadily resisted all efforts of the government to Russianize them, clinging to their use of the Finnish language and their acceptance of the Lutheran creed. A small aristocratic minority is German in blood and sympathy.

Like the other Baltic provinces—Courland and Livonia—Esthonia set up an independent liberal government in 1917, on the downfall of the Russian Empire, for the people had suffered greatly from Russian oppression. In 1918, when Russia surrendered to Germany and signed the Treaty of Brest-Litovsk, German armies entered each of the Baltic provinces, overthrew the native governments and set up a new régime under German leadership. The collapse of Germany itself, in November, 1918, caused a withdrawal of the German forces, but the Esths were not left in peace. Trotzky's Bolshevik soldiers were sent against them, and for months there was bitter fighting. In January, 1920, peace was agreed upon, leaving Esthonia free. See RUSSIA; WORLD WAR.

ESTUARY, *es′tu a ri,* a widened channel connecting a river with the ocean or other large body of water. It is really a greatly-broadened river mouth, resulting originally from a drowned valley, then made larger through the centuries by erosion. Estuaries are usually comparatively shallow, for they are continually filling with sediment brought to them from upper courses of the rivers, and often shifting sandbars obstruct navigation. This shifting results, in estuaries joining the ocean, from advancing and receding tides. In many estuaries, as in those on the Bay of Fundy, the tides rise with great rapidity. Examples are Delaware Bay, those in Chesapeake Bay, the Thames, the Severn and the Elbe.

ETCH′ING, the process of engraving metal plates by means of an acid. The plate is cleaned and covered with an *etching ground,* which is a composition of Egyptian asphaltum, wax and pitch. This protects the surface from the action of the acid. The design is then cut through this coating with steel tools, called *etching needles,* and the plate is placed in a weak solution of nitric acid. The acid eats, or "bites," the design into the plate. The different degrees of light and shade are produced by etching some portions of the plate more than others. After the lines which require but little etching have been formed, that portion of the plate is again covered with etching ground and the action of the acid on it stopped. Some of the finest works are reproduced by combining etching and engraving in the preparation of the plates. See ENGRAVING; ZINC ETCHING.

ETESIAN, *e te′zhan,* **WINDS,** the north and northeast winds which blow across Southern Europe and the Mediterranean during the summer. Apparently they are an indraft towards the Sahara. They are strongest in July and August.

ETHELWULF, *eth′el woolf* (?–858), the father of Alfred the Great. His father, Egbert, gave him the three petty kingdoms of Kent, Essex and Sussex, which he united under one government. On the death of Egbert, Ethelwulf succeeded to the higher throne of Wessex and transferred the subordinate kingdom to his son Ethelstan. His reign was rendered uneasy by Norse invaders, who were with difficulty driven out. On his return from a journey to Rome he found that his son Ethelbald had usurped his throne. Ethelwulf's people were loyal, but the usurper's following was large enough to have stirred up civil war. To avert this the king abdicated the throne of Wessex in favor of Ethelbald and took for his own dominion the little kingdoms he had at first governed.

ETHER, *e′thur,* a colorless liquid with a sweetish smell, used extensively in surgery because its fumes make the patient insensible to pain. Its chemical name is *ethyl ether.* Ether is about three-fourths as heavy as water, and is somewhat soluble in that liquid. As its vapor is extremely inflammable, it should never be brought near a flame. An American dentist, William Thomas Green Morgan, was the first to use it regularly in dentistry (1846), and since then it has been one of the most valuable anesthetics known. It is considered safer than chloroform (which see), and its disagreeable after-effects, chiefly nausea, may be lessened by freeing the drug from all impurities before administering it. Some physicians favor injecting a mixture of ether and olive oil into the lower bowel as a preventive measure.

ETHER, the medium through which light, heat and other forms of energy are transmitted. Scientists tell us that the rays which the earth receives from the sun could not reach our planet unless they had some medium through which to travel. Accordingly, they suppose all space to be filled with an extremely rare substance which has neither weight nor color, and they call it ether. Of the nature and property of this substance scientists know very little. See LIGHT.

ETHICS, *eth'iks,* the science which treats of the nature of the moral obligations one person owes to another and to his community at large; it outlines those rules which should determine conduct. Some writers on the subject declare it to be the science of ideal humanity, and this it really is. It may be best not to consider it generally in such exalted sense, for the teaching of ethics will be more effective if there is carried the impression that it is possible easily to measure up to the standards set. Ideal humanity is something the world should strive for, but we are easily discouraged in the belief that such a state can soon be reached. Let us, then, say that our subject goes not beyond an inquiry into the nature of what is good, a study of that which is preferable and desirable; an investigation into what is right and what falls clearly in the line of duty. We prefer this middle ground because it is not at all theoretical; when one theorizes there is always danger that others will declare him visionary. What we all need is practical precept and principle, so plainly stated that there is no escape from acceptance of the truth. Knowing the way, then, or having a guide, makes it easier for us to walk uprightly.

Importance of Moral Training. Surely parents and teachers should not underestimate the value of ethical culture. In the right moral atmosphere—we do not mean strained, affected Puritanism—where every act seems the entirely appropriate thing and nothing violates the injunction, "Let everything be done decently and in order," the child establishes ethical standards without knowing it. Every child's moral nature reflects his surroundings; when the parent, the teacher, the state, eliminate wrong and injustice, the ideal humanity referred to will be a reality. Parents give children their earliest surroundings, and stamp upon them the impress of earliest influences; by the time the task of mind- and character-building is passed on to be shared with the teacher a great deal in the way of training has been accomplished, for good or ill, which is to be permanent. It is a pity, but it is true, that habits are frequently formed by the young through the faults of their elders, yet we blame the wayward child for the traits he has developed. In all fairness, this should not be done. A very wise man said that the moral education of a boy or girl should be begun with the grandparents. We readily understand what he meant.

Especially Needed To-day. While moral training has always been important, it is particularly so at the present time, for the following reasons:

1. In a system of democratic government the laws of the country derive their authority from the consent of the governed. The strongest safeguard against lawlessness and the enactment of vicious laws is a public moral sentiment which will not tolerate the one nor support the other.

2. Our present industrial system separates employer from employe, parents from children; creates classes in society, and makes practically impossible the old-fashioned home with its benign and sacred influences. Unless special emphasis is placed upon moral training during childhood, the public standard of morals will be lowered.

3. Our complex life tends to a confusion of moral ideas on the part of some. There are altogether too many men who possess a "stratified conscience;" that is they have one conscience for their home life, another for their church life, a third for their social life, and a fourth for business. "Mr. A is the soul of honor in his private life, but in business he is not to be trusted," says one. "Mr. B. is a very faithful attendant upon the services of his church on Sunday, but look out for him on the other days of the week," says another. Unfortunately, the conditions here described are so numerous as to make the above examples commonplace. We say that a person following different moral standards lacks principle, and this is true; but he lacks as well a moral training which would have given him a clear conception of right and wrong and developed in him the power of deciding for and adhering to the right.

Recognizing the importance of moral training—the kind which in most cases may accomplish its object—we consider it a high privilege to present the helpful material found in the pages which follow. The principles stated are fundamental, and the purpose of the article is to show parents and teachers how they can aid those under their charge in gaining high ideals of right and in forming the habit of maintaining those ideals. To be aware of ideals is not sufficient; to strive to reach them in every-day affairs and live according to them is greatly to be de-

Outline on Ethics

- Right and Wrong
  - Impulse
  - Action
    - Immoral Acts
    - Non-Moral Acts
  - What a Moral Act Includes
    - Knowledge
    - Desire
    - Choice
    - Execution
  - Ideals
    - Heredity
    - Early Training
    - Public Opinion
    - Associates
  - Change of Ideals
  - Moral Standards
- Helpful Suggestions
  - Environment
  - Mental Attitude
  - Example
  - Books
  - Self-Restraint
  - Self-Reliance
  - Reason and Judgment
- Questions for Discussion

sired. The accompanying outline will assist in the study of the article.

Right and Wrong

Impulse. Every idea has in it what may be called an impulsive element, that is as soon as the idea is entertained there comes along with it a tendency to carry it out in action. In children, and in some people of mature years as well, this element is so strong that it leads to immediate execution of the idea, regardless of the consequences. People in whom this element is strongly developed are called impulsive. If their acts are disastrous either to themselves or to others, and they are asked why they do such things, the usual reply is, "Oh, I did it before I thought," or "I didn't think."

The thoughtful man is inclined to censure impulsive people, but he should not condemn impulse, for in impulse lie the beginnings of action. The impulsive or motor element in ideas should be brought under the control of the will and be guided by reason. In this way it will be led to manifest itself in acts that are beneficial to the individual and helpful to those with whom we associate. In brief, impulse properly guided leads to right action. Without guidance it is liable to lead to wrong action. One of the first steps in moral training consists, therefore, in helping the child to gain control over his impulses.

The child is particularly a creature of impulse; the reason and the will develop slowly, and for the first ten or twelve years of his life the child is moved to action more by his feelings than by any other power. Parents and teachers who understand the training of children recognize this condition and endeavor to keep the children under their charge in a happy frame of mind. In a state of happiness the desirable emotions are active, and these in turn lead the child to right action in his relation to others.

Moral Acts. What is a moral act? Do all acts contain a moral quality? While there may be some differences of opinion upon these questions, it is generally accepted that moral acts are those which are concerned with our relation to others, or with the development of our own character. For instance, casting one's vote is a moral act. In his vote the citizen registers his choice for officials to administer the law or for measures which affect the welfare of the state or community. His choice affects not only himself but those with whom he is associated. Again, a boy's obedience to rightful authority, as a request or a command of his father or mother or his teacher, is a moral act. It shows that he recognizes and conforms to the proper relation which he sustains to the one making the request or giving the command.

Acts relating to the development of our own character cannot be wholly separated from acts relating to others. What we are determines what we do. On the other hand, what we do helps to make us what we are. A good illustration of this class of acts is found in those acts which are concerned with the formation of personal habits, such as truthfulness, honesty and the like.

Immoral Acts. Acts which are contrary to the welfare of society and of the individual are immoral. Indulgence in an appetite for intoxicants is immoral because their effect is injurious both to body and mind. Appropriating that which belongs to another without his consent, or without giving him an equivalent in return, is immoral. Deception in any form is immoral, and to the above list many other illustrtions can be added.

Non-Moral Acts. A non-moral act is one which sustains no relation to others and will have no specific effect upon one's character. Such, for instance, is the swinging of the arm when walking; multiplying one number by another simply for the multiplication or when there is nothing depending upon the result. In the discussion of morality non-moral acts are usually given little or no consideration.

What a Moral Act Includes. A complete moral act brings into play all the mental powers. It consists of the following steps:

1. **Knowledge.** You must know whether the contemplated act is right or wrong before you can determine its moral quality.
2. **Desire.** The knowledge gained leads to a desire to perform the act.
3. **Choice.** Knowledge and desire lead to decision. You choose to do or not to do.
4. **Execution.** Having made the choice, you proceed to carry it out in action. The act is performed or it is dismissed from the mind.

A concrete illustration will enable us to fix these steps more clearly in mind. Henry, a boy of twelve, started for school one morning in time to enable him to walk the mile between his home and the schoolhouse and be in his seat when school called. Before he was half-way there he discovered a neighbor's colt so entangled in a wire fence that the animal was liable to serious injury unless released at once. Upon examination Henry found that unaided he could not release the colt. He saw that the colt was in danger (knowledge); he therefore wished to release it (desire), but if he went for help he must be late at school. Which should he do—go for help or go on to school? He decided to return home and get help (choice). He no sooner reached this decision than he started for home (action).

The reader will be interested, possibly, in analyzing a number of his own acts after this plan. In the study of the illustration, or in the analysis of his own acts, however, the reader should bear in mind that the last step is the crowning achievement, and that unless this step is taken, the others are of no value. Many a young man can trace the beginning of his downfall to his failure to act upon the good resolutions he made.

Ideals. Though we may understand that a moral act is a right act, it is not always easy to decide whether an act is right or wrong. Such is the difference of opinion, that the same act is often considered right by one and wrong by another. The questions "What is right?" "What ideals shall I follow?" and "What ideals shall I lead those under my charge to follow?" are constantly before the conscientious parent and teacher. If we would lead those having less experience than ourselves in the paths of right, we must first of all be familiar with those paths ourselves. Our ideas of right and the ideals that we form are shaped by a number of influences; chief among them are the following:

Heredity. Everyone is born with certain inherited tendencies. These become more or less prominent in childhood and exert an influence over one's entire life. These tendencies may be beneficial or injurious. They are modified to a greater or less extent by environment and training. If given proper attention in childhood, inherited tendencies can usually be brought under the control of the will. Those which are undesirable should be suppressed, and those which are beneficial should be strengthened. Many people assign to heredity a much larger share of responsibility in the development of character than justly belongs to it.

Early Training. We never wholly depart from the teaching of the first ten years of our lives. The ideas of right and wrong received during these years abide to a greater or less extent in our moral consciousness. The early moral training, both direct and indirect, which a child receives is therefore of the greatest importance.

Thomas lives in a home whose inmates are kind and courteous to each other, and whose atmosphere is pleasant. He is taught to be kind, truthful and generous. By the time he is ten years of age he has learned that these virtues are right and that their opposites are wrong. Andrew lives in a home where there is constant strife; the inmates exercise their ingenuity in deceiving each other and in trying to gain some advantage over their associates. To Andrew lying and selfishness are virtues, and truthfulness and generosity are weaknesses practised only by those who have not sufficient courage to withstand their fellows. These boys go out into life with directly opposite moral ideas as the result of their home training. Between these extremes are many grades of moral code, each formed by home training and association.

Public Opinion. Every social group, whether of children or adults, has its moral code, and failure to conform to this code is a cause for disapproval, if not for censure and expulsion. This code expresses the moral sentiment of the group, be it large or small, and this is what we usually mean when we speak of public opinion. It requires courage to stand against public opinion. Let Thomas remove to a locality where the most of his boy associates are of Andrew's type, and he can remain true to his moral code only by constant struggle and possibly an occasional fight. If Thomas is a lad of weak will, he will soon yield to his companions and adopt, with possibly some mental reservation, a good portion of their moral code.

The case of Thomas is that of a large number of people of older growth. When removing from one locality to another they often find themselves at variance with the community they have entered. What shall they do? Shall they adhere rigidly to their established moral code and be looked upon as "queer," "Puritanic," and so on, or shall they overlook these points of difference and conform to the usages of society? These are among the most important questions that ever confront a young man or a young woman upon leaving home, and their decision often marks the turning point in the person's life.

A young person of good moral training and strong will will not give up those moral principles upon which his character is founded. Furthermore, he will adhere to such virtues as truthfulness, honesty, sobriety and industry. However, if one's moral convictions are not firmly fixed, one is very liable to change one's moral standard, because in so doing the individual follows the line of least resistance.

Earnest people who believe the moral code of society to be partially wrong refuse to conform to those beliefs and practices which their conscience will not approve. Such people are staunch moralists, and although the thoughtless may deride them, their influence in a community is always good. In time this influence usually wholly changes or in part modifies the objectionable practices. The reformer not only refuses to adopt the moral code of society, but he openly and aggressively goes to work to change public opinion until it shall coincide with his views.

Associates. One's ideas of right are more or less influenced by the opinions of those with whom one comes in daily contact and by the opinion of intimate friends. When two people are associated, the stronger influences the weaker and the result is a modification of ideas. This influence is much stronger with children and young people than with those of more extended experience. We can, therefore, see the necessity of safeguarding the young from evil associates. The saying of the wise man, "Keep thy heart with all diligence, for out of it are the issues of life," is as potent now as when it was uttered three thousand years ago.

Change of Ideals. To the active mind the ideal of to-day is different from that of yesterday. Every day sees advancement; man's view of moral truth is broader and his insight into moral principles is deeper. This growth does not necessarily imply the forsaking of old principles and the adoption of new ones. It is more likely to mean the discovery of new opportunities of applying these principles, and with each new application the strength and significance of the principles are increased. In this way our moral ideas expand. Men and nations regard each other with greater respect and kindlier feelings to-day than they did a century ago. The ideal hero of the fifteenth and sixteenth centuries was the warrior; the ideal hero of the twentieth century is the man who can prevent war. Ex-President Roosevelt gained greater renown by bringing about the treaty which closed the Russo-Japanese War than any military or naval commander in that conflict. This is also true in local communities; the man who is held in highest esteem is he who uses his talent in promoting the peace and welfare of the community.

Again, the true boy hero of to-day is not the bully of the playground, but the boy with the moral courage that enables him to stand by what he knows to be true and right, and thereby promote a public sentiment which drives the bully to cover.

Breadth of view leads to tolerance. Many pastimes and pleasures that were formerly considered harmful and even sinful, are now accepted and indulged in as being beneficial. People of experience are more lenient toward young offenders than are those of their own age. These facts do not imply that moral principles have been discarded, but that they are more broadly applied.

Moral Standards. From the foregoing discussion we see that moral questions are often complex and that even the man of education and experience occasionally finds it difficult to decide what is right in certain cases. This is true to a much greater extent of those who lack training and experience. For these reasons moral standards should be established, and those virtues which for ages have been recognized as right by all civilized peoples, should become firmly fixed during the periods of childhood and youth. The most important of these virtues are truthfulness, honesty, fidelity, reverence, sobriety and kindness. However widely people may differ in their application of these virtues, they are universally recognized as constituting the foundation of all good character, and their installation should be the chief aim of moral instruction. Teachers and parents will be aided in this work by giving attention to the points mentioned under the title "Helpful Suggestions":

Helpful Suggestions

Environment. The body exerts a strong influence over the mind. While now and then we find a brilliant intellect associated with a weak and sickly body, in general, health and vigor of the body lead to a clear intellect and a clear conscience. The surroundings of children should be pleasant and of such nature as to give them the bodily comfort necessary to a happy frame of mind. Plain, nourishing food and loose, comfortable clothing are important factors in moral training. Children who live in the country have greater advantages for the development of character than many of those who live in the city. The country child communes with nature and learns many of her secrets. For a portion of the time, at least, his companions are birds, plants, animals, trees, flowers, verdant hills and running brooks. The city child may be confined to streets and alleys for his playgrounds and may have vicious companions only for his associates.

Whether in city or country the home life should be made attractive. There should be no place where the child can find so much pleasure and enjoyment as at home. An atmosphere of love and kindness should pervade the home, and through his association with the other inmates, as well as by precept and example, the child should be led to practice the virtues we have named.

Mental Attitude. The mental attitude exerts a strong influence upon character. The child who is always happy is kind, truthful and honest. His desirable feelings are constantly active and they give little or no opportunity for fear, anger, hatred and other undesirable emotions to appear. Teasing, nagging and scolding by those who have the care of children are reprehensible, and their practice is a serious obstruction to the development of right character.

Example. In nothing is the adage "Example is better than precept" more clearly proven than in moral training. Children are imitators, and they strive to become like those whom they love. By the time he is ten every boy has a pattern that he is following. This pattern may be a living personality or it may be the hero of some tale. Parents and teachers should not only do what they wish their children to do, but it is equally or more important that they refrain from doing those things which they do not wish their children to imitate.

Books. A word should be said about the value of reading as an agency in the formation of character. Next to friends and associates, books exert the greatest influence over the young. A story like Ruskin's *King of the Golden River,* Hawthorne's *Great Stone Face,* Longfellow's *Evangeline* and scores of others that might be named, whether in prose or verse, will do more toward the development of character than any number of discourses on duty, honesty or other virtues. Many maxims gleaned from books when memorized are also helpful and often inspiring.

Fortunately, school and other public libraries are now so common, and good books can be procured at such slight expense, that suitable reading can be placed in the hands of all. Just here a word of caution may not be out of place. The young should be safeguarded from vicious literature as carefully as from evil associates. Both exert a baneful influence. Inhibition, or the power to arrest a previous action, is the highest prerogative of the will. The wise use of this power shows that the will has been well trained.

Self-Restraint. Thrice armed against evil is that young person who during childhood learned to say "No" and to stand by it. In the development of character restraint is as essential as action. One is led astray by first consenting to little things which are wrong. One step leads to another, and thus the character is lowered. Resistance to temptation must be acquired in the home if it is to be acquired at all.

Self-Reliance. In the formation of character it is necessary for the youth to learn to rely upon himself. In order that he may do this he must recognize his own powers and believe in them. Those who are unable to stand alone are easily led into temptation. From the beginning the child should be trained to do all that he can for himself. Too many parents and teachers do far too much for the children under their care. The maxim "Never do for the child what he can do for himself" may occasionally be taken too literally and cause waste of time and energy, but in general it is a safe maxim to follow. Within the capacity of his judgment the child should be led to decide moral questions for himself. Muscle, intellect and conscience gain strength only through exercise.

Reason and Judgment. We have seen that many moral questions are complex, and that often a right decision can be reached only through a careful investigation of all the circumstances involved. Questions of this kind can be decided only by those who can think clearly and exercise sound judgment. The thought powers develop later than the powers of observation and memory, hence young children can do but little reasoning and should not be asked to decide complex questions. During the period of youth, however, the thought powers should receive particular attention. By discussion, illustration and experience, young people should be led to realize that hasty judgment is faulty judgment. Exercise for training the reason should not be confined to problems in arithmetic and grammar; the affairs of everyday life furnish many interesting and profitable problems for consideration.

Questions for Discussion

Ethical Training. The following questions are given as illustrations of what may be done in the home, the school or in clubs and other organizations to train one to reason along ethical lines. Some of the questions are very simple, while others are so complicated that they will tax the ingenuity of the keenest intellects. In every case the reason for the decision should be given.

The discussion of two of these questions given below shows how they may be used. Considerable amusement can be derived from questions of this nature, whether in the home or school, or wherever any number of people are gathered. The discussions which are sure to follow their introduction serve the double purpose of training the reasoning powers and of showing those taking part the necessity of considering all the evidence in a case before a just decision can be reached.

Examples. At the close of school someone took Lucy's umbrella by mistake. Lucy remained to do some extra work, and when ready to depart she found only one umbrella. It was raining and she must take this umbrella or be exposed to the storm. On the way home she broke the umbrella. The next morning it was learned that the umbrella belonged to Fred. Who should pay for mending the umbrella?

"Lucy, of course," says Tom. "She broke it."

"Fred," says Nellie. "Boys, not girls, are always expected to pay such bills."

"Whoever took Lucy's umbrella," says Henry. "That person was responsible, for he made the mistake."

Are any of these answers right? If so, which one?

On examining Tom's answer we find that Lucy was obliged to use the umbrella as a means of defense against a boy who did not attend school and that it was in so doing that she broke the umbrella. The accident resulted from necessity, not carelessness.

We see at once that Nellie's answer is founded on sentiment, rather than justice. In discussing this answer George remarks that girls and women nowadays are trying to take the places of boys and men in almost all kinds of work, and if they want to do men's work he doesn't see why they should not take men's responsibilities.

Henry passes by those directly connected with the affair and strikes at the original cause; but no one is willing to own up to taking Lucy's umbrella.

Under the circumstances, who should pay for mending the umbrella?

Tom Brown on his way to high school one morning found a lady who had been run over and dangerously wounded. Tom saw that unless the lady received medical assistance at once she would die from loss of blood. A delivery team was standing near by and Tom lifted the lady into the wagon and drove rapidly to the hospital. He was so intent upon securing assistance for the lady that he did not stop to hitch the horse, and while they were carrying the patient into the hospital, Henry Adams came along and waved an umbrella at the horse, frightening it so that it ran away. The wagon was broken, a little girl was run over and seriously injured and the horse was killed. Who should pay?

"Tom's father," says A.

"Henry's father," says B.

"The lady's husband," says C.

"The one who was responsible for the injury to the lady," says D.

Let us consider each of these answers in the light of the circumstances connected with the case.

A makes Tom's father responsible because he claims that in taking the team Tom did what he had no right to do, and in leaving the horse unhitched he was grossly careless. But A overlooks the fact that Tom was saving a life, and that this was of more importance than anything else connected with the affair.

B places the responsibility upon Henry's father, alleging that had Henry not frightened the horse, all would have been well. But Mr. Adams claims that Henry was a lad of seven and too young to realize the possible consequences of his act. He did not intend to frighten the horse; he was only interested in the peculiar way in which the horse looked at the umbrella.

C would throw the burden upon the lady's husband, because he claims that the husband should be willing and glad to pay any cost which resulted in saving his wife's life. But the lady was a widow; therefore, some other source of payment must be found.

D passes over all those immediately connected with the affair and places the responsiblity upon the one who injured the lady. However, no one knows who he is.

The little girl's father had a heavy doctor's bill to pay, and the grocerymen lost their team. From whom are they entitled to collect damages?

Two government officers are sent to the Yosemite with a large sum of money. As they drive round a corner in a rough part of the country, two highwaymen spring out and yell, "Hands up!" The officers at once obeyed. Did they do right?

Factories sell their typewriters to teachers for $70, but the price to other people is $100. Your principal buys a machine for $70 and decides in a few days he does not care for it and offers to sell it to a lawyer. What should he ask the lawyer for it? Should the teacher or principal ask permission of the firm to sell the typewriter for less than $100?

Tom saw Fred cheating in an examination. After it was over Tom said to Fred, "You are a good friend of mine, but your cheating in the examination was wrong in four ways." What do you think were the four ways that Tom had in mind?

Henry is trying to decide whether or not he ought to go to college. He is talented, but poor; his father is dead and his mother is not strong. How ought Henry to decide the matter?

Dick and Keran are in the same room at school. Dick got mad at the teacher one day, and that evening when the two boys were going past the schoolhouse, Dick had revenge on the teacher by throwing a snowball through the window in the schoolhouse. Keran saw him do it. The next day the school-teacher asked each boy in the school privately what he knew about it. What should Keran say when she asked him?

A boy goes to spend the night with his friend, another boy about the same age. The boys' room is lighted by a defective lamp. In the night the visiting boy gets up in his sleep and lights the lamp. The lamp explodes and sets fire to the house, which is totally destroyed. The house was insured for two-thirds of its value. Who should pay for the house?

A boy has $1 which he received for 10 tickets which he sold for the school entertainment. A sudden freeze makes the skating good and he spends the money for a pair of skates, fully intending to replace it from his earnings which he would receive for delivering papers. He fails to get the money for his teacher for the tickets. Was he wrong?

A bank cashier takes money from the bank for speculation and loses it. A wealthy friend makes good the loss, so that none of the depositors loses any money. Should the cashier be punished? Did the cashier do wrong? Whom did he wrong?

ETHIOPIA, *e the o'pi a,* in ancient times the name applied to the country lying to the south of Egypt and comprising what is now Nubia, Kordofan and Abyssinia. Its limits, however, were not clearly defined. The connection between the two countries has at all times been very close. About the eighth century B. C. the Ethiopians were able to impose a dynasty on Lower Egypt. Cambyses, king of Persia, invaded the country about 530 B. C. and destroyed the capital city, Napata. From this time the country was known as the kingdom of Meroë, from the name of the capital city which replaced Napata. In the sixth century A. D. the country became the Christian Kingdom of Dongola.

ETHNOGRAPHY, *eth nog′ra fi*, the science which collects every available fact concerning human races and peoples. It is one of the most important branches of anthropology, but not until the time of the discovery of America were efforts made to study the races of men. Since then, however, the ethnographer has been constantly at work, and now each of the great governments of the world has a bureau for the purpose of investigating not only the different races that come under its rule, but also the races of other nations. At Washington, the Bureau of American Ethnography devotes itself to the study of Indian tribes. See the article ANTHROPOLOGY, and the accompanying list of related topics.

ETHNOLOGY, *eth nol′o ji*, one of the three main branches of anthropology. It takes the facts discovered by ethnography (which see) and uses them in an attempt to explain the causes that have brought about the changes in the human race. Among these causes geographical environment has played the chief part, and the developments include changes in religion, in social and political organization, progress in art and material culture. See the article ANTHROPOLOGY and the accompanying list of related topics.

ETIOLATION, *et i o la′shun*. When a growing plant is put in a dark place it becomes pale and almost colorless; its growth becomes lank and unhealthy. The change in color is caused by the absence of chlorophyl, the green coloring matter of plants, which cannot be produced without sunlight. The attenuated growth is due to the plant's eagerness to find light. This change in color and growth is known as etiolation.

ETNA, or **AETNA**, the greatest volcano in Europe, in Sicily, near the city of Catania. It rises immediately from the sea to an altitude of 10,755 feet, has a circumference of more than 100 miles and dominates the whole northeast part of Sicily. There are a number of towns on its lower slopes. The top is covered with perpetual snow; at the foot is a region of orchards, vineyards and olive groves; midway is the woody or forest region. From the summit a splendid panorama is presented, embracing the whole of Sicily, the Lipari Islands, Malta and Calabria. The eruptions of Etna have been numerous, and many of them destructive. That of 1169 overwhelmed Catania and buried 15,000 persons in the ruins. In 1669 the lava spread over the country for forty days, and 10,000 persons are estimated to have perished. In 1693 there was an earthquake during the eruption, when over 60,000 lives were lost. One eruption was in 1755, the year of the Lisbon earthquake. Among more recent eruptions are those of 1832, 1865, 1874, 1886 and 1911. The last named was especially violent and destroyed much valuable property. See VOLCANO.

E′TON COLLEGE, the most famous public school of England, established by Henry VI in 1440, under the name of *The College of the Blessed Mary of Eton beside Windsor*. The original building, begun in 1441, is still occupied, but since that day many additional buildings have been erected. The school was originally intended for the sons of poor but worthy Englishmen and also for the support of twenty-five poor, infirm men. It has now become the school of boys from the gentry and nobility, and the applications are so numerous that it is customary to enter application at the birth of the child, in order to insure his admission by the time he is of proper age. Students are not admitted under twelve years of age or over fourteen. The school prepares students for college. The standard English athletic games are given much attention, and Eton boys are fine specimens of health.

ETRU′RIA, a name given by the ancient Romans to that part of Italy bounded by the Apennines, the Tiber and the Mediterranean. The inhabitants, called Etruscans, came originally from Asia Minor, and, according to their own legends, they were settled in Italy and were in a flourishing condition by the middle of the eleventh century B. C. It is certain that at the foundation of Rome, Etruria was the most civilized portion of Italy.

There were at one time three Etruscan confederacies, each composed of twelve city states. Each state had its own government. From the earliest times the Etruscans were engaged in constant warfare with Rome, which terminated in the complete subjugation of Etruria through a series of Roman victories, from the fall of Veii in 396 B. C. to the Battle of Vadimonian Lake in 283 B. C.

Etruscan art was in the main borrowed from Greece. Great quantities of relics have been found in the tombs, especially jewelry and painted vases (see below).

Etruscan Vases. Though made in Etruria, these vases were not products of Etruscan art, since they were really the productions of Greek workmen, the subjects, style and inscriptions being all Greek. A great number have been found in the tombs in Etruria and in Campania, Sicily. They are elegant in form and are enriched with bands of beautiful foliage and other ornaments and figures of a highly artistic character. One class has black figures and ornaments on a red ground, the natural color of the clay; another has the figures of the natural color and the ground painted black. During a later period of Etruscan art there was much variety in the form and ornamentation of these vases, gold and other colors being frequently made use of in their embellishment.

ETYMOLOGY, *et i mol′o ji,* the study of the origin and history of words. The most important text for the person who wishes to know something about etymology is an unabridged dictionary. The average person would hardly call a dictionary a fascinating book, but if studied in the right way it will prove to be full of interesting word histories. Words are not dead, stationary things; they develop and change with the passing of time, and sometimes come to have meanings quite different from those with which they started. The word *villain* is an instance. It is derived from the Latin *villa,* meaning *village,* and in the days of William the Conqueror it signified a common peasant or villager. In Bacon's time a villain was a clownish person, or boor; to-day the term is applied to one who is a scoundrel. Etymology is a subject of absorbing interest, as well as one of great educational value.

BLUE GUM

EUCALYPTUS, *u ka lip′tus,* a genus of trees, mostly natives of Australia, remarkable for their gigantic size, some of them attaining heights between 480 and 500 feet. In the Australian colonies they are called gum trees, because gum exudes from their trunks. The wood is excellent for shipbuilding and similar purposes. The *blue gum,* famous for its rapid growth and ability to live through long periods of drought, is one of the best known species. This tree has become thoroughly naturalized in California, Florida and others of the Gulf states. The oil of eucalyptus is used medicinally, and a beverage is made from the sap of one species.

EUCHARIST, *u′ker ist,* a term applied in the Christian Church to the sacrament of the Lord's Supper. The word is derived from the Greek for *thankfulness.* Both Protestants and Greek and Roman Catholics observe this sacrament, the partakers of which are usually served bread and wine (or grape juice) about the altar or communion rail. In the Roman Catholic Church the observance is called the Blessed Sacrament. The observance of communion is obligatory upon Catholics during Pascal season, but weekly or even daily observance is common. Protestants do not as a rule have the ceremony oftener than once a month.

EUCHRE, *u′kur,* a game played by two, three or four persons, with a pack of cards from which all below seven or nine, as may have been agreed upon, have been rejected (See CARDS, PLAYING). Each player is dealt five cards, two together and then three together, after which the trump is turned. If the trump turned is a jack it counts one to the dealer. The one to the left of the dealer may order the dealer to take up the trump, or he may *pass.* He does the former if he thinks he has a hand strong enough to win three tricks, and the dealer, discarding one of his cards, takes up the trump. If he passes, the dealer's partner may order up the trump by saying "I assist," or he may pass, and so on, until the dealer's turn comes, when he takes up the card or turns it down, the latter meaning that he, too, passes. If the dealer passes, the first player to his left may make the trump what he likes. It is usually the suit of the same color. If the play passes around the second time and no one makes the trump, the deal passes to the left. It is a rule of the game that suit must be followed whenever possible.

The object is to win at least three tricks out of the five, and if the one who made the trump fails to win three, he is *euchred,* and his opponent scores two. If he takes five tricks he scores two points. If he wins three or four tricks he scores one point. The cards rank as they do in whist, but in the trump suit the *right bower,* or jack of trumps, stands highest; the *left bower,* the other jack of the same color, is next, then ace, king, queen, and so on, in order, to the lowest. Sometimes in four-handed euchre it is permitted for one of the players to *play it alone,* in which case his partner lays down his cards and takes no part in the hand. If the player wins five tricks he counts four points; if three tricks, one point. If he fails to make three, the opponent scores two. A game of euchre consists either of five or ten points, unless another number is agreed upon. A three-handed game, in which two players combine against one, is known as *cut-throat euchre.*

EUCLID, *u'klid,* of Alexandria, a distinguished Greek mathematician who lived about 300 B. C. His *Elements of Geometry,* in thirteen books, are still extant, and the name Euclid is to-day synomymous with elementary geometry. The severity and accuracy of his methods of demonstration have as a whole never been surpassed. Besides the *Elements,* a few other works are attributed to Euclid.

EUGENE, *u jeen',* ORE, the county seat of Lane County, about 125 miles south of Portland, on the Willamette River, the Southern Pacific Railroad and electric lines. The city is the seat of the state university, and it has also a Bible College. There is a city hall, a city library, a court house, a water system owned by the city, and an electric light plant. A Federal building, completed in 1908, is the location of the post office and of the Forest Service. It is the center of a fertile agricultural district. The manufactures include lumber (Douglas fir is plentiful), flour, foundry products, woolen goods, incubators and other products. Population, 1910, 9,009; in 1920, 10,593.

EUGENICS, *u jen'iks,* a science that studies ways and means of improving the quality of the human race. Its founder, Sir Francis Galton, selected the name *eugenics* as a proper one for the "science of being well born." The word is from the Greek for *good birth.* Advocates of the movement lay great stress on the advantage of being born of healthy parents, and they are working for more stringent marriage laws.

The laws of heredity declare that the qualities of every child come from his ancestors, near and remote; and experiments with the higher animals prove clearly what may be done if all but the most perfect individuals are eliminated. If, then, the state had the right and the power to prevent marriage and reproduction among all but those who are most fit, physically, mentally and morally, vast differences might be seen in the race within a few generations. But the most enthusiastic advocate of eugenics would deny the desirability of such a course, even were it practicable; for all agree that the science must be kept human, and that love and initiative on the part of those making marriages are factors which must be preserved.

One thing the state can do—prevent the marriage of the feeble-minded and the hereditary criminal classes; and this would in itself be a vast improvement. In earlier and less humanitarian times, those who were feeble in mind or in body tended to be crushed out in the struggle for existence; but the charity of the present day helps to keep such people alive, and at the same time does nothing to prevent their bringing into the world children who can be neither helpful nor happy. Such agencies, too, as war, which cause the death of many of the strongest men, necessarily result in a lower physical standard.

Looked at from any point of view, there are insuperable difficulties in the way of a strict enforcement of the principles of eugenics. Much can be done, and is being done, however, by the wide spread of the new doctrines among intelligent men and women. A few states of the Union have passed laws so strict as to call forth doubts as to their practicability, and several others have laws forbidding the marriage of the insane, epileptics and feeble-minded.

EUGENIE-MARIE DE MONTIJO, *o zha ne' mah re' de mon tee'ho* (1826–1920), widow of Napoleon III. She was born at Granada, Spain, the daughter of Count de Montijo and a Scotch woman named Kirkpatrick. In 1853 she became the wife of Napoleon III and Empress of the French. Beautiful and clever, frivolous and pleasure-loving, she exerted a powerfully pernicious influence at court. She led the emperor into numerous political mistakes, notably the disastrous Mexican expedition of Maximilian and the Franco-Prussian War. When the war broke out with Germany (1870) she was appointed regent during the Emperor's absence, but a revolution forced her to flee from France. She went to England, where she was joined by her son and later by the emperor. In 1873 Napoleon died, and six years later the prince imperial was slain while serving with the English army in Africa, in the Zulu War. After 1881 Eugenie lived chiefly at Farnborough, in Hampshire, England.

EUPHORBIA, *u for′be ah.* See SPURGE FAMILY.

EUPHRATES, *u fra′teez,* a celebrated river of Western Asia, in Asiatic Turkey, having a double source in two streams rising in Central Armenia. Its total length is about 1,750 miles, and the area of its basin 260,000 square miles. It flows mainly in a southeasterly course through the great alluvial plains of Babylonia and Chaldea, till it falls into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. About seventy miles from its mouth it is joined by the Tigris, where the united streams take the name of Shat-el-Arab. The Euphrates is navigable for about 1,100 miles, but navigation is somewhat impeded by rapids and shallows. Through its yearly overflow, however, which takes place in the spring, it confers great benefit on the country through which it flows. The river is of great historical importance, having been connected with the Assyrian and Babylonian empires, which were located on its banks. The region between the Euphrates and the Tigris on the east was the ancient Mesopotamia, and in this district there was considerable fighting during the World War. See TIGRIS RIVER; WORLD WAR.

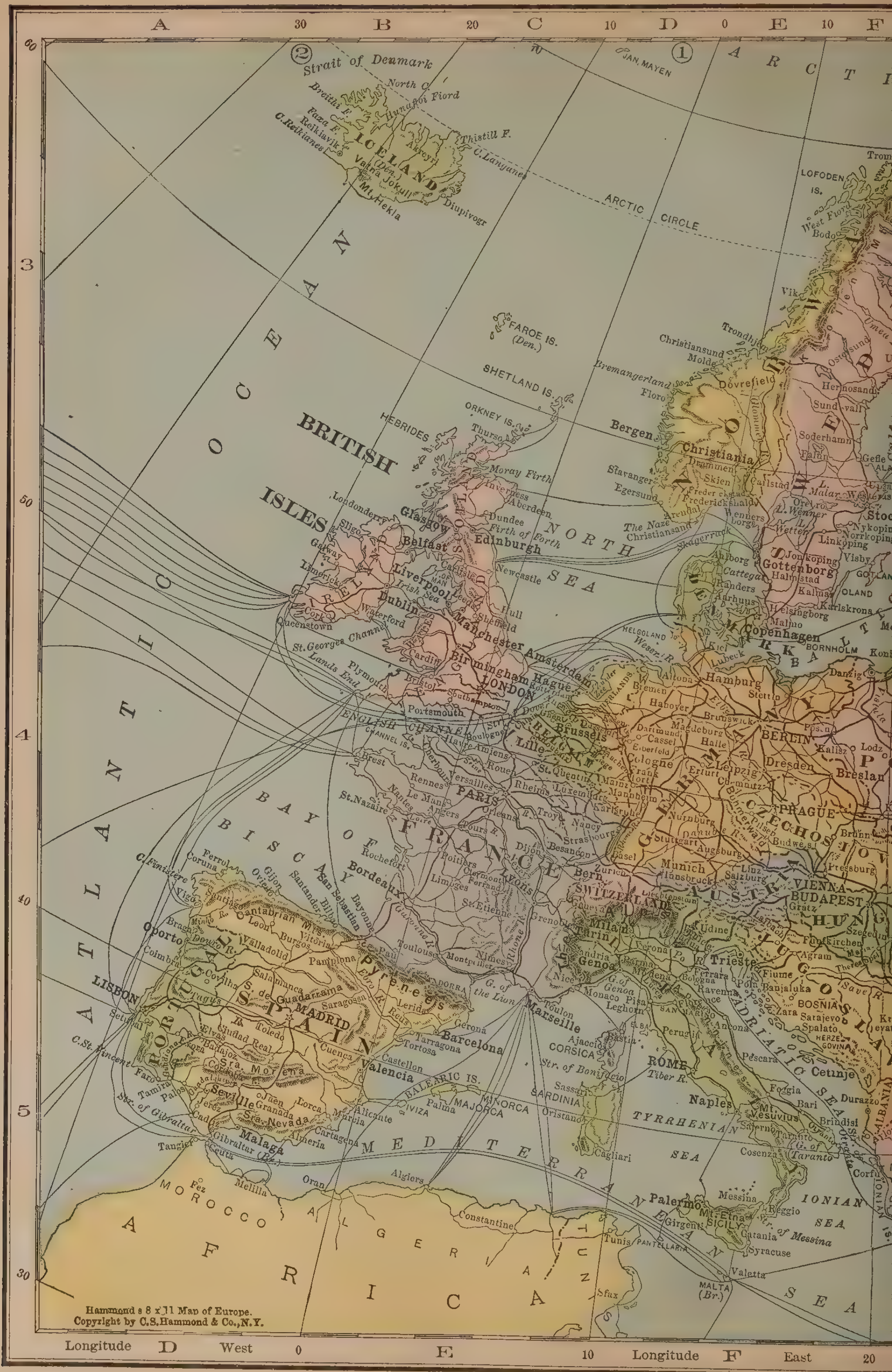
EURA′SIANS, a name sometimes given to the "half-castes" of India, the offspring of European fathers and Indian mothers. They are particularly common in Calcutta, Madras and Bombay. Many of the young men are engaged in government or mercantile offices. The girls, as a rule, are very pretty.

EUREKA, *u re′kah,* CAL., the county seat of Humboldt County, about 215 miles north of San Francisco, on Humboldt Bay and on the Northwestern Pacific Railroad. There is ocean steamship connection with Pacific ports. The city has several miles of water frontage, lined with lumber yards, planing and shingle mills and other manufacturing establishments. It is a center of the redwood industry. Large quantities of lumber, butter and other products are shipped from here, and the yearly average of exports amounts to about $11,000,000. It has also extensive tanneries and a large woolen mill. The city has broad, well-paved streets, an ample water supply, electric light and power and gas plants, daily papers, banks, an opera house and theaters. An electric railroad is in operation and is being extended. Population, 1910, 11,845; in 1920, 12,923 (Federal census).

EUREKA SPRINGS, ARK., in the Ozark Mountains, one of the county seats of Carroll County (Berryville being the other), 150 miles northwest of Little Rock, near the Missouri boundary, on the Missouri & North Arkansas Railroad. The town is important for its forty or more mineral springs of medicinal properties. There is a Carnegie Library and a girls' school, in addition to hotels for the large number of guests who visit the springs. Onyx is found in the vicinity. Population, 1920, 2,429.

EURIPIDES, *u rip′i deez,* (about 480–406 B. C.), one of the three great tragic poets of Greece. He studied under Prodicus and Anaxagoras and is said to have begun to write at the age of eighteen, although his first play, the *Pleiades,* did not appear until some years later. In 441 B. C. he was successful in winning the first prize in dramatic competition and continued to compete for thirty-three years. Euripides is a master of tragic situations and pathos, and shows much knowledge of human nature and skill in grouping characters, but his works lack the artistic completeness and the sublime earnestness that characterize Aeschylus and Sophocles. As a representative of the new order which did not believe in the old gods of Greece, he had more interest in the thoughts and feelings of real men and women than in the experiences of legendary heroes. His characters, it is true, were drawn from mythology, but they were free-will beings, rather than puppets of the higher powers. Euripides is said to have composed seventy-five, or, according to another authority, ninety-two tragedies. Of these, eighteen are extant. The best-known are *Alcestis, Medea, Andromache, Electra, Iphigenia in Tauris, Orestes* and *Iphigenia in Aulis.*

EURO′PA, in Greek mythology, the daughter of Agenor, king of the Phoenicians and the sister of Cadmus. The fable relates that she was carried off by Jupiter, who for the abduction had assumed the form of a bull.



Hammond's 8 x 11 Map of Europe.

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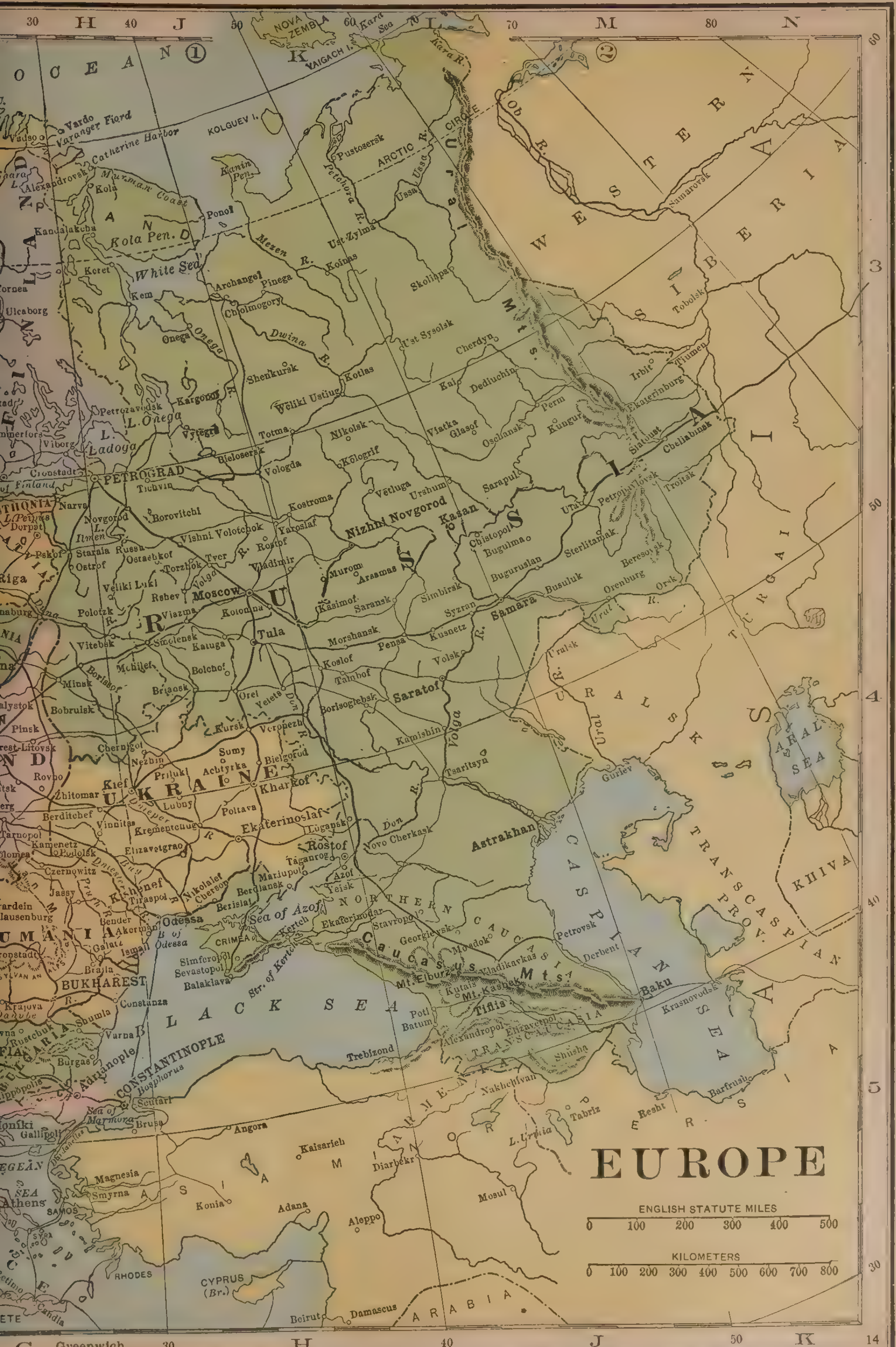

EUROPE

ENGLISH STATUTE MILES
0 100 200 300 400 500
KILOMETERS
0 100 200 300 400 500 600 700 800
30 H 40 J 50 60 70 L 70 M 80 N
G Greenwich 30 H 40 J 50 K 14
60 3 50 4 40 5 30
① ②
OCEAN
NOVA ZEMBLA
Kara Sea
VAIGACH I.
Kara R.
K
KOLGUEV I.
Vardo
Varanger Fiord
Vadso
Catherine Harbor
Alexandrovsk
Kola
Murman Coast
Kandalakcha
Kola Pen.
Ponoi
Kanin Pen.
Pustoserask
ARCTIC CIRCLE
Ussa R.
Ussa
Petchora R.
Ust Zylma
Mezen R.
Koinas
White Sea
Koret
Kem
Archangel
Pinega
Cholmogory
Onega
Onega R.
Dwina R.
Shenkursk
Kargopol
Petrozavodsk
L. Onega
Vytegra
L. Ladoga
Viborg
Cronstadt
Finland
PETROGRAD
Tichvin
Bieloseresk
Vologda
Totma
Weliki Ustiug
Kotlas
Ust Sysolsk
Skolikpa
Cherdyn
Kai
Dedluchin
Nikolsk
Kologrif
Viatka
Glasof
Oschansk
Perm
Kungur
Ural Mts.
Ob R.
Samarovsk
WESTERN SIBERIA
Tobolsk
Irbit
Tiumen
Ekaterinburg
Zlatoust
Cheliabinsk
Petropavlovsk
Troitsk
Ufa
Sterlitamak
Beresovsk
Orenburg
Orsk
Ural R.
TURGAI
URALSK
Uralsk
Ural R.
Gurlev
ARAL SEA
TRANSCASPIAN PROV.
KHIVA
ESTHONIA
Narva
L. Peipus
Dorpat
Pskof
Novgorod
L. Ilmen
Borovitchi
Staraia Russa
Ostashkof
Vishni Volotchok
Yaroslaf
Kostroma
Nizhni Novgorod
Vetluga
Urshum
Kasan
Sarapul
Chistopol
Bugulma
Buguruslan
Busuluk
Ostrof
Torzhok
Tver
Rostof
Vladimir
Murom
Arsamas
Velikl Luki
Rshev
Volga R.
MOSCOW
Kolomna
Kasimof
Saransk
Simbirsk
Syzran
Samara
Riga
Dvinsk
Polotzk
Viazma
RUSSIA
Tula
Morshansk
Pensa
Kusnetz
Volsk
Vitebsk
Smolensk
Kaluga
Bolchof
Koslof
Tambof
Saratof
Mohilef
Borissof
Minsk
Briansk
Orel
Yelets
Don R.
Borisoglebsk
Bialystok
Bobruisk
Pinsk
Kursk
Voronezh
Kamishin
Volga R.
Tsaritsyn
Brest-Litovsk
Chernigof
Nezhin
Sumy
Achtyrka
Bielgorod
Rovno
Zhitomar
Kief
Priluki
UKRAINE
Kharkof
Lubny
Poltava
Berditchef
Vinnitsa
Krementchug
Ekaterinoslaf
Lugansk
Don R.
Novo Cherkask
Astrakhan
Tarnopol
Kamenetz Podolsk
Elizavetgrad
Rostof
Taganrog
Mariupol
Azof
Czernowitz
Dniester R.
Bug R.
Jassy
Prut R.
Kishenef
Tiraspol
Nikolaief
Cherson
Berdiansk
Yeisk
NORTHERN CAUCASIA
Klausenburg
RUMANIA
Bender
Akerman
Odessa
B. of Odessa
Berislav
Sea of Azof
Kertch
Ekaterinodar
Stavropol
Georgievsk
Mosdok
Petrovsk
Derbent
CASPIAN SEA
Kronstadt
Galatz
Ismail
CRIMEA
Simferopol
Sevastopol
Balaklava
Str. of Kertch
Caucasus Mts.
Mt. Elburz
Vladikavkas
Mt. Kasbek
Baku
Krasnovodsk
Braila
BUKHAREST
Constanza
BLACK SEA
Kutais
Poti
Batum
Tiflis
Alexandropol
Elizavetpol
TRANSCAUCASIA
Shusha
Krajova
Danube
Rustchuk
Shumla
Varna
BULGARIA
Burgas
Adrianople
Philippopolis
CONSTANTINOPLE
Bosphorus
Trebizond
ARMENIA
Nakhichivan
Barfrush
Scutari
Sea of Marmora
Brusa
Gallipoli
Dardanelles
Angora
Kaisarieh
Diarbekr
KURDISTAN
L. Urmia
Tabriz
Resht
PERSIA
AEGEAN SEA
Magnesia
Smyrna
ASIA MINOR
Konia
Adana
Aleppo
Mosul
Athens
SAMOS
RHODES
CYPRUS (Br.)
Beirut
Damascus
ARABIA
Retimo
Candia
CRETE

EUROPE, the most important of all the grand divisions, though exceeded in size by all of the continents except Australia. Asia and Africa cradled the world's oldest civilizations, and in Asia were born all of the great religions, including Christianity, but Europeans or their New World descendants have shaped modern civilization and created its standards of industry, education, music and art. In Europe the most progressive branches of the white race struggled from savagery to an advanced stage of progress, and in this continent Christianity had its most important development—two outstanding facts in the history of civilization.

Location and Coast Line. The continent of Europe is really a great peninsula projecting from Asia, and the two are often spoken of as Eurasia. Europe extends from the Arctic Ocean on the north to Asia Minor, the Black Sea and the Mediterranean Sea on the south; its western border touches the Atlantic Ocean and the North Sea, and its eastern the Ural Mountains, the Ural River and the Caspian Sea. The most northerly point, North Cape, lies in the midst of polar ice; Cape Tarifa, in Spain, is the point farthest south.

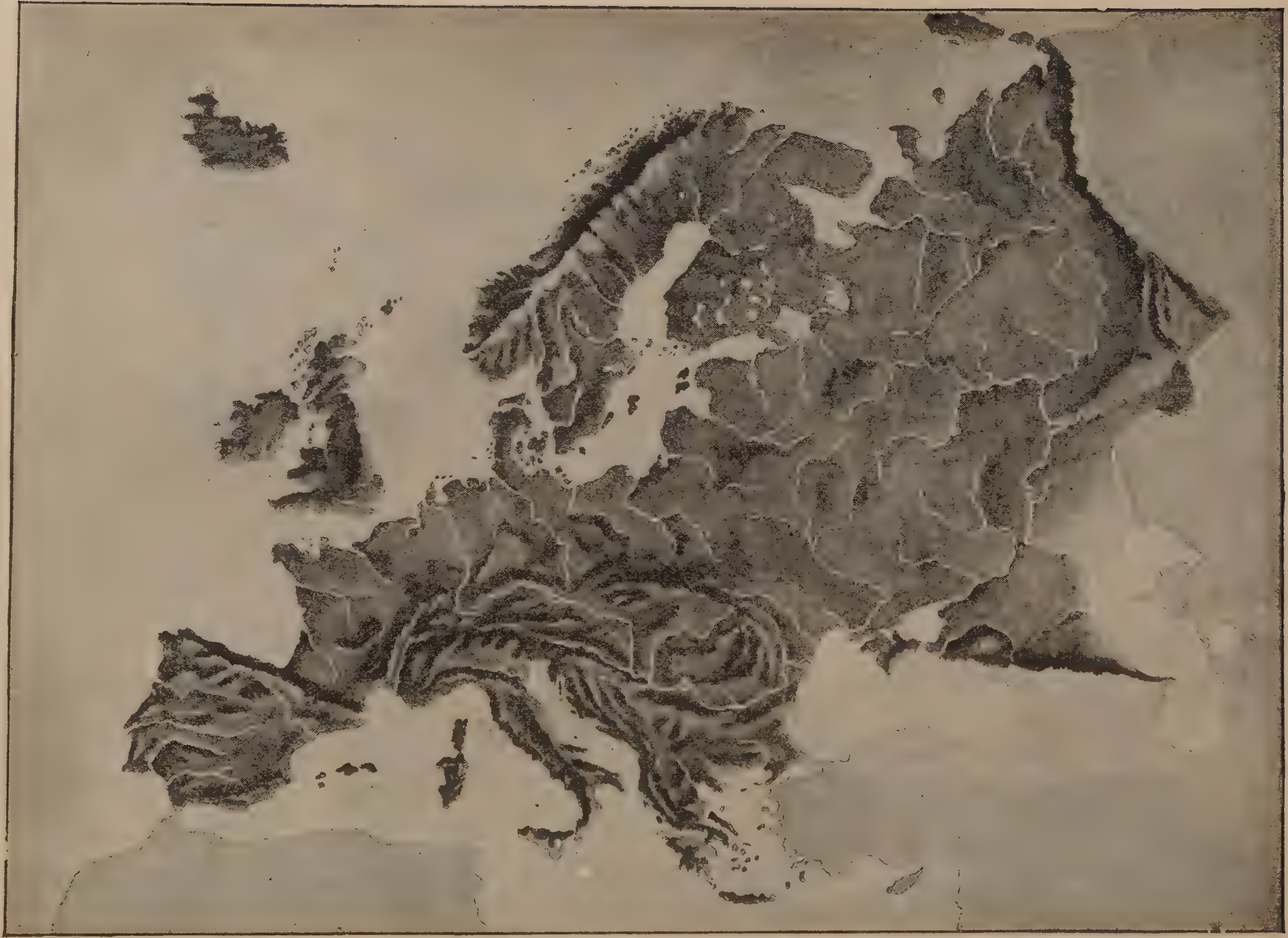
The coast line is very irregular and extended, being longer, in proportion to area, than that of any other grand division. Its length is variously estimated at from 20,000 to 48,000 miles. This variation is due to the method of measurement, the shorter line including only the large indentations, while the longer includes all of the smaller ones.

The important coast waters are, on the north, the White Sea; on the east, the Caspian Sea; on the south, the Black Sea and Sea of Azov, the Bosporus, Sea of Marmora, Dardanelles, Aegean Sea, Adriatic Sea, Gulf of Genoa, Gulf of Lyons and Strait of Gibraltar, and on the west, Bay of Biscay, English Channel, Strait of Dover, North Sea, Baltic Sea, Gulf of Bothnia and Gulf of Finland.

The continent contains a number of important projections. On the west there are the Scandinavian peninsula and Denmark; on the south, Spain, Italy and the Balkan peninsula, containing Turkey and Greece. The surrounding islands of importance are, on the north, Nova Zembla and Kolguev; on the west, the Lafodens, Faroe, Shetland, Orkney, Hebrides and British Isles, near the coast, and Iceland in mid-ocean. The important islands of the Mediterranean are the Balearic Isles, Corsica, Sardinia, Sicily, Crete and the numerous smaller groups in the Ionian and Aegean seas. Most of these islands are out-croppings of the projected mountain ranges, and between them and the continent the sea is comparatively shallow.

Area and Population. With an area of 3,754,282 square miles, Europe is less than half as large as North America, and only about one-fourth larger than continental United States. Yet this comparatively small continent is divided into more than twenty nations—twenty-six at the outbreak of the World War (1914). At the close of the war several new nations appeared, as Austria-Hungary was broken up according to racial lines. Europe is more densely populated than any other continent, with an average density in normal times of 125 people to the square mile. Belgium and England are normally the most crowded countries in the world. The total population of Europe in 1914 was about 480,000,000, over three times that of North America, which so greatly exceeds it in area. Over 7,000,000 Europeans lost their lives in the World War.

Surface and Drainage. Fully two-thirds of the continent is low land, the larger part of which is a continuation of the great Asiatic plain, which is broken only by the Ural Mountains and has its western terminus in the lowlands of the British Isles. With the exception of the Kjölen Mountains, or Scandinavian Alps, forming the western boundary of the peninsula of the same name, the northern part of the continent is all low, and the plain extending westward includes the northern part of Germany, most of Belgium, the Netherlands and the northern and western part of France. The highlands consist of the main highland region in the south, having the Alps for its center, and numerous lower ranges to the north, the Ural Mountains in the extreme northeast, and the Kjölen in the northwest.



PHYSICAL MAP OF EUROPE

The southern highland district is by far the most important. This embraces the Alps and their neighboring ranges and attains its greatest height just north of the Italian peninsula, in Mont Blanc, Monte Rosa, Jungfrau and Matterhorn, with several other peaks, some of which exceed 15,000 feet in altitude. The greatest extent of these mountains is from east to west, and they have a length of nearly 700 miles. The plateau upon which they rest is crossed by minor ranges in various directions, and the southern spurs, namely, the Balkans, Apennines and Pyrenees with their projections, form the nucleus of the respective peninsulas occupied by Turkey and Greece, Italy, and Spain and Portugal. The Alps are divided by natural passes into three divisions, the western, central and eastern, and through these and other passes means of communication between the north and south have been maintained for centuries, while now in the neighborhood of three of them—Mount Cenis, Saint Gotthard and Simplon—railroad tunnels have pierced the mountains.

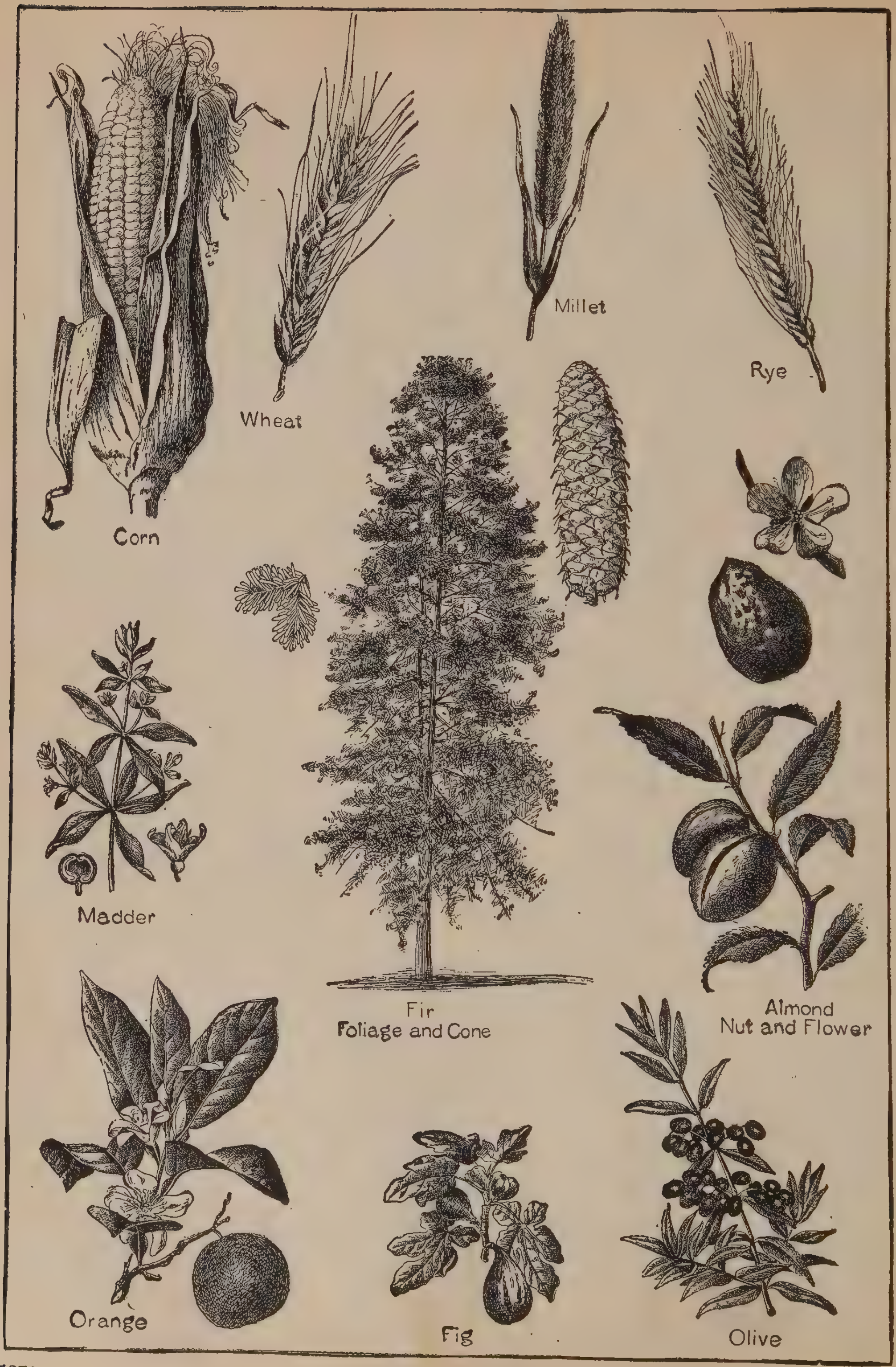
North and east of the Alps are the Carpathians, the Jura, the Harz and other minor ranges, with an altitude seldom exceeding 6,000 feet, but in a few cases reaching nearly 8,000. Between these mountains and the Alps are the great valleys of the Danube and the Upper Rhine, while on the south, between the main range of the Alps and the Apennines, is the valley of the Po, and to the west the Rhone descends to the Mediterranean between the Alps and the eastern extremity of the range connecting the Pyrenees. While the connection of the Pyrenees with the Alps is not evident geographically, geologists generally consider them to form a part of the same mountain system, and these with their western extension, the Cantabrians, form a practically impassable barrier between the Spanish peninsula and the countries to the north. South of these the Sierra Nevada and their branches give the peninsula its rugged and mountainous surface.

Rivers and Lakes. The main European watershed runs in a winding direction from southwest to northeast. At its northeastern extremity it is of very slight elevation. From the Alps descend some of the largest of the European rivers, the Rhine, the Rhone and the Po, while the Danube, a still greater stream, rises in the Black Forest north of the Alps. The Volga, which enters the Caspian Sea, an inland sheet without outlet, is the longest of European rivers, having a direct length of nearly 1,700 miles, and, including windings, 2,400 miles. Into the Mediterranean flow the Ebro, the Rhone and the Po; into the Black Sea, the Danube, the Dnieper, the Dniester and the Don; into the Atlantic, the Guadalquivir, the Guadiana, the Tagus and the Loire; into the English Channel, the Seine; into the North Sea, the Rhine and the Elbe; into the Baltic, the Oder, the Vistula and the Duna; into the Arctic Ocean, the Dvina.

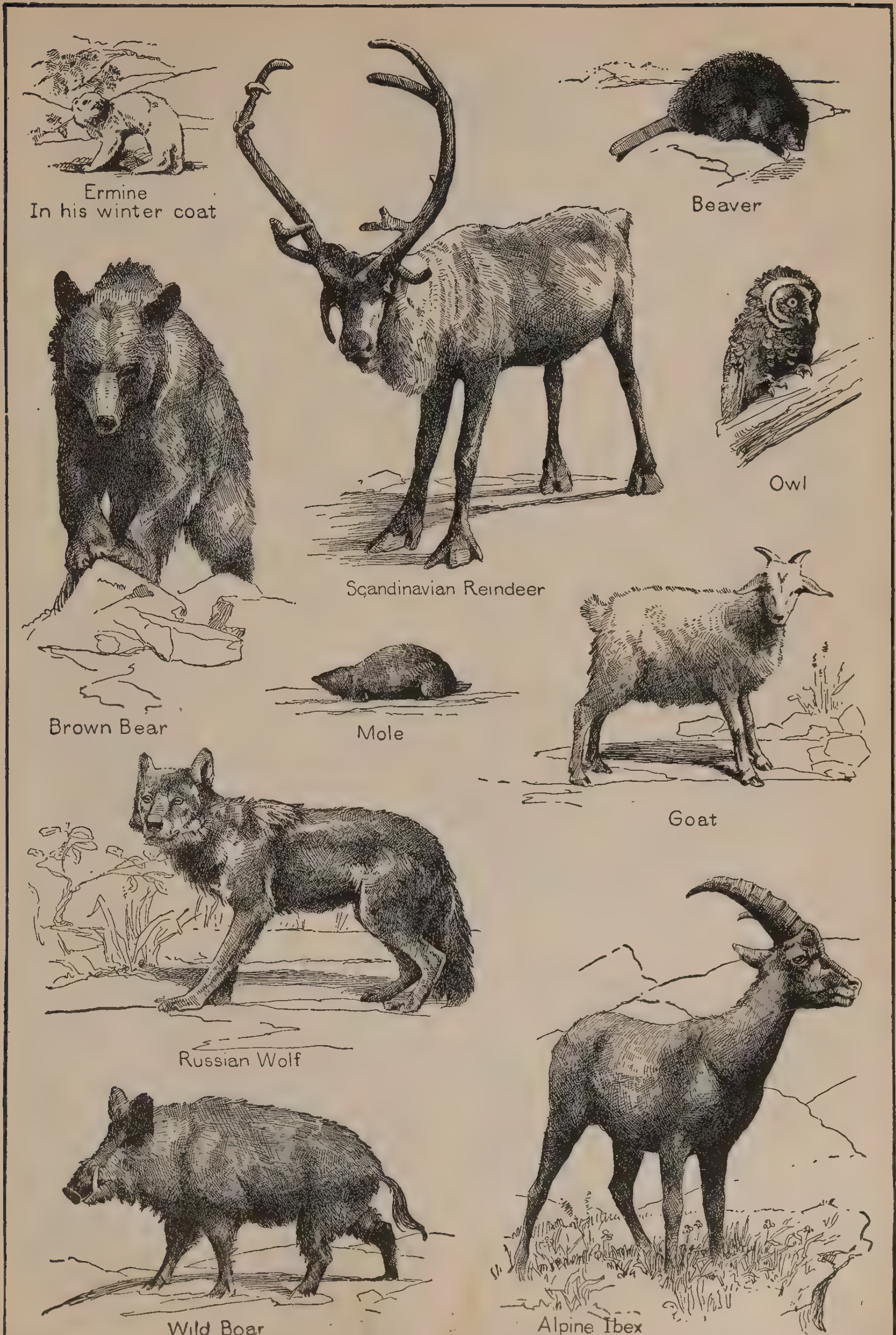
The lakes of Europe may be divided into two groups, the southern and the northern. The former run along both sides of the Alps, and among them, on the north side, are the lakes of Geneva, Neuchâtel, Thun, Lucerne, Zürich and Constance; on the south side, Lago Maggiore and the lakes of Como, Lugano, Iseo and Garda. The northern lakes extend across Sweden from west to east, and on the east side of the Baltic a number of lakes, stretching in the same direction across Finland on the borders of Russia, mark the continuation of the line of depression. It is in Russia that the largest European lakes are found—lakes Ladoga and Onega.

Mineral Resources. Europe possesses abundant stores of those minerals which are of the most importance to man. Coal and iron are found all through the central portion of the highland region, between the fortieth and sixtieth parallels of latitude, and are of sufficient abundance to be profitably worked in Norway, Sweden, Belgium, Germany, France and the British Isles. The Scandinavian peninsula also contains rich silver ore; valuable deposits of quicksilver are found in the Harz Mountains and in Spain, while in the Ural Mountains are stores of copper and platinum. Tin occurs in Great Britain and in Brittany. Italy abounds in marble of excellent quality, and nearly all of the mountainous countries contain extensive quarries of granite, limestone and other building material, while in many localities are clays valuable for the manufacture of brick and pottery.

Climate. Several circumstances concur to give Europe a climate peculiarly genial, such as its position almost wholly within the temperate zone and the great extent of its coast waters. Much benefit is derived also from the fact that its shores are exposed to the warm marine currents and warm winds



PLANTS OF EUROPE



ANIMALS OF EUROPE

from the southwest, which prevent the formation of ice on most of its northern shores. The eastern portion has a less favorable climate than the western. The extremes of temperature are greater, the summer being hotter and the winter colder, while the lines of equal mean temperature decline south as they go east. The same advantages of mild and genial temperature which Western Europe has over Eastern Europe, the continent as a whole has over the rest of the Old World. The diminution of mean temperature, as well as the intensity of the opposite seasons, increases as we go east. Peking, in latitude 40° north, has as severe a winter as Petrograd, in latitude 60°. Throughout the continent there is sufficient rainfall for agriculture, and there are no desert areas.

Vegetation. With respect to the vegetable kingdom Europe may be divided into four zones. The first, or most northern, is that of fir and birch. The birch reaches almost to North Cape; the fir ceases a degree farther south. The cultivation of grain extends farther north than might be supposed. Barley ripens even under the 70th parallel of north latitude; wheat ceases at 64° in Norway, 62° in Sweden. Within this zone, the southern limit of which extends from latitude 64° in Norway to latitude 62° in Russia, agriculture has little importance, the inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech and cereal produce, extends from the limit above mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation, belong to this zone, in the more moist parts of which cattle husbandry has been brought to perfection. Next is the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of southern Europe. Here the oak still flourishes, but the pine species become rarer. Rye, which characterizes the preceding zone on the continent, gives way to wheat, and in the southern portion of it to maize, also. The fourth zone, comprehending the southern peninsulas, is that of the olive and evergreen woods. The orange flourishes in the southern portion and rice is cultivated in a few spots in Italy and Spain. See full page plate, *Plants of Europe*.

Animal Life. The reindeer and polar bears are peculiar to the north. Bears and wolves still inhabit the forests and mountains; but, in general, cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout the continent. The ass and mule lose their size and beauty north of the Pyrenees and Alps. The Mediterranean Sea has many species of fish, but no great fishery; the northern seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackerel, cod and salmon. See full page plate, *Animals of Europe*.

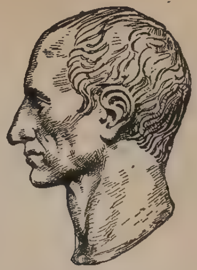
Inhabitants. Europe is occupied by several different peoples or races, in many parts now greatly intermingled. The Celts once possessed the west of Europe from the Alps to the British Islands. But the Celtic nationalities were broken by the wave of Roman conquest, and the succeeding invasions of the Germanic tribes completed their political ruin. At the present day the Celtic language is spoken only in the Scotch Highlands (Gaelic), in some parts of Ireland (Irish), in Wales (Cymric) and in Brittany (Armorican). Next to the Celtic comes the Teutonic race, comprehending the Germanic and Scandinavian branches. The former includes the Germans, the Dutch and the English. The Scandinavians are divided into Danes, Swedes and Norwegians. To the east of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Russians, the Poles, the Czechs or Bohemians, the Servians, Croatians and a few others of lesser importance.

In the south and southeast of Europe are the Greek and Latin peoples, the latter comprising the Italians, French, Spanish and Portuguese. All the above peoples are regarded as belonging to the Indo-European, or Aryan, stock. To the Mongolian stock belong the Turks, Finns, Lapps and Magyars, or Hungarians, all immigrants into Europe in comparatively recent times. The Basques, at the western extremity of the Pyrenees, are a people whose affinities have not been determined. The prevailing religion is the Christian, embracing the Roman Catholic Church, which has the most communicants, the various sects of Protestants—Lutheran, Calvinistic, Anglican, Baptists, Methodists—and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan, religion.

History. The name Europe is a corruption of the Assyrian word *Ereb,* which means *land of the setting sun.* The ancient inhabitants

DAVID. Michelangelo

VICTORY OF SAMOTHRACE

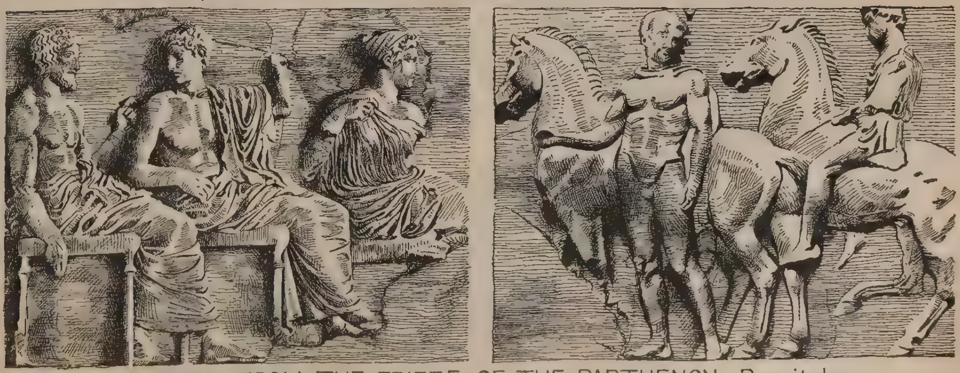


JULIUS CAESAR

VENUS OF MILO

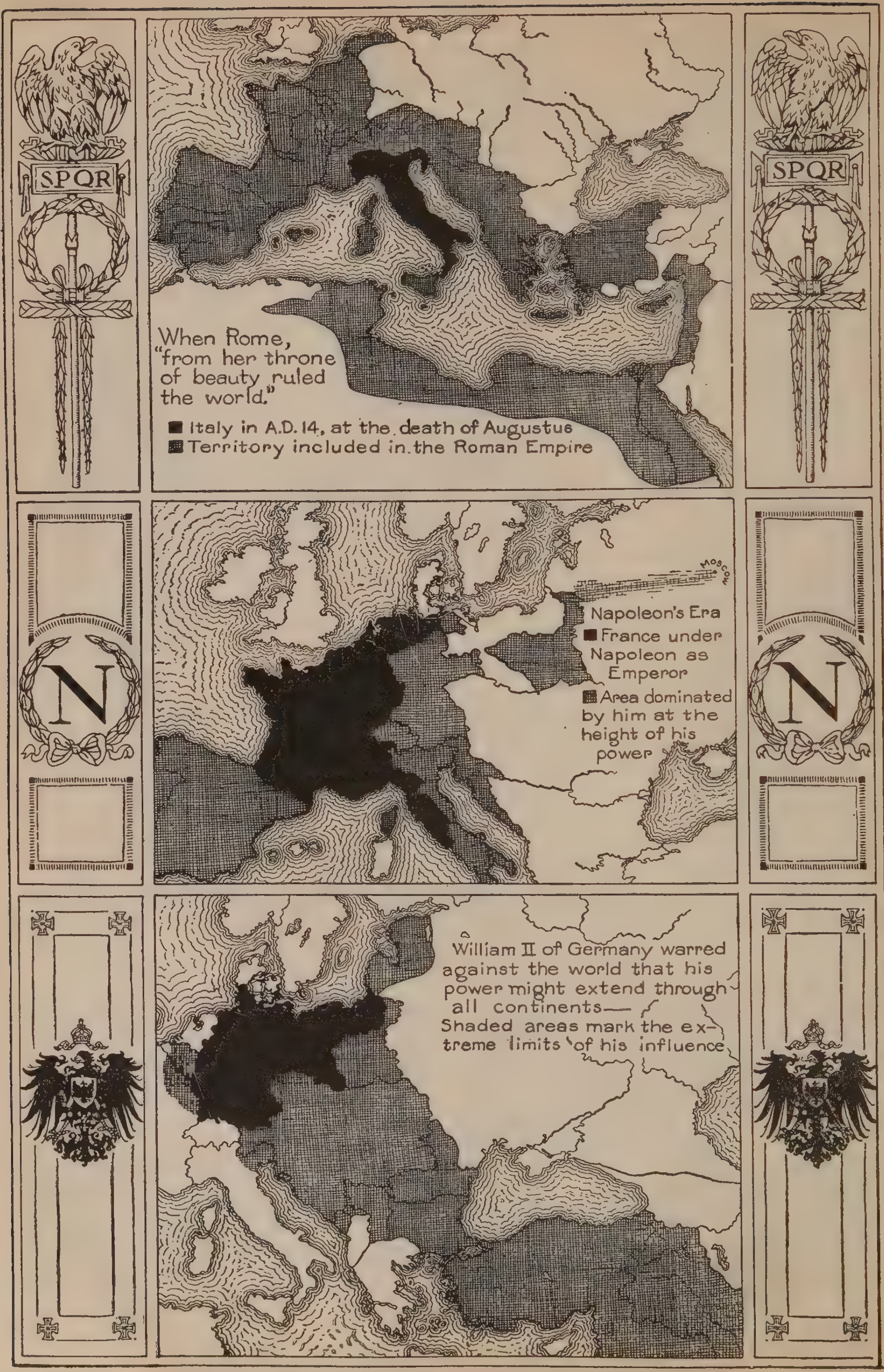
LAST DAY OF NAPOLEON. Vela

DISCOBOLUS OF NAUCYDES



DETAIL FROM THE FRIEZE OF THE PARTHENON. Praxiteles

EUROPEAN SCULPTURE


SPQR
When Rome, "from her throne of beauty ruled the world."
■ Italy in A.D. 14, at the death of Augustus
▨ Territory included in the Roman Empire
N
MOSCOW
Napoleon's Era
■ France under Napoleon as Emperor
▨ Area dominated by him at the height of his power
William II of Germany warred against the world that his power might extend through all continents—
Shaded areas mark the extreme limits of his influence

THREE GREAT ATTEMPTS TO GAIN WORLD POWER of Asia Minor so named it, calling their own country *Assu land, of the rising sun.* The first authentic history of Europe begins in Greece at about 776 B. C. Greek civilization was at its most flourishing period about 430 B. C. After Greece came Rome, which, by the early part of the Christian Era, had conquered Spain, Greece, Gaul, Helvetia, Germany between the Danube and the Alps, Illyria, Dacia and a few other regions. Improved laws and superior arts of life spread with the Roman Empire throughout Europe, and the unity of government was also extremely favorable to the extension of Christianity. With the decline of the Roman Empire a great change in the political constitution of Europe was produced by the universal migration of the northern nations. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection or becoming incorporated with them.

Under Charlemagne (771–814) a great Germanic empire was established, so extensive that the kingdoms of France, Germany, Italy, Burgundy, Lorraine and Navarre were afterward formed out of it. About this time the northern and eastern nations of Europe began to exert an influence in the affairs of the continent. The Slavs, or Slavonians, founded kingdoms in Bohemia, Poland, Russia and the north of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe, founding kingdoms and principalities in England, France, Sicily and the East. The Crusades and the growth of the Ottoman power are among the principal events which influenced Europe from the twelfth to the fifteenth century. The conquest of Constantinople by the Turks (1453), by driving the learned Greeks from this city, gave a new impulse to letters in Western Europe, which was carried onward by the Reformation and the invention of printing.

The discovery of America was followed by the temporary preponderance of Spain, then of France, in Europe. Subsequently, Prussia and Russia gradually increased in territory and strength. The French Revolution (1789) and the Napoleonic wars had a profound effect on Europe, the dissolution of the old German Empire being one of the results. Since then the most important events in European history have been the establishment of the independence of Greece; the disappearance of Poland as a separate state; the unification of Italy under Victor Emmanuel; the Franco-German War, resulting in the consolidation of Germany into an empire under the leadership of Prussia; the partial dismemberment of the Turkish Empire and the war between Turkey and Greece (1897); the Spanish-American War, (1898), which deprived Spain of its chief colonies; the Anglo-Boer War (1899), which strengthened Great Britain's hold upon Southern Africa; the Russo-Japanese War (1904), which deprived Russia of its supremacy in the Far East; the Turko-Italian War (1911–1912), by which Italy gained possession of Tripoli; the Turko-Balkan War (1913), which left Turkey no territory in Europe except Constantinople and surrounding territory; and the World War, which involved all of the Great Powers and caused an unprecedented loss of life and property. The details of that struggle and its effect on the different nations will be found under the heading WORLD WAR. See also the subhead *History,* in the articles on the various countries.

Related Articles. Consult the following titles for additional information:

GEOGRAPHY

Adriatic Sea
Aegean Sea
Alps
Apennines
Arctic Ocean
Arno
Atlantic Ocean
Avernus
Azov, Sea of
Balkan Mountains
Baltic Sea
Biscay, Bay of
Black Forest
Black Sea
Bosporus
Bothnia, Gulf of
Carpathian Mountains
Caspian Sea
Cattegat
Caucasus
Cenis, Mont
Cevennes
Constance, Lake
Danube
Dardanelles
Dnieper
Dniester
Don
Elbe
English Channel
Garonne River
Geneva, Lake
Gibraltar
Harz
Jungfrau
Jura
Loire
Lucerne, Lake of
Maggiore, Lake
Main
Marmora, Sea of
Marne
Matterhorn
Mediterranean Sea
Meuse
Mont Blanc
Moselle
Neuchâtel, Lake of
Neva
North Sea
Olympus
Parnassus
Pyrenees
Oder
Po
Rhine
Rhone
Riga, Gulf of
Rosa, Monte
Rubicon
Saint Gotthard
Saone
Scheldt
Seine
Sierra Nevada
Somme
Skagerrak
Tiber
Ural Mountains
Valdai Hills
Vosges Mountains
White Sea
Zurich, Lake
Vistula
Volga

POLITICAL DIVISIONS

Albania
Alsace-Lorraine
Andorra
Austria
Belgium
Bulgaria
Courland
Czecho-Slovak Republic
Denmark
England
Finland
France
Germany

Great Britain
Greece
Hungary
Ireland
Italy
Jugo-Slavia
Lapland
Liechtenstein
Lithuania
Livonia
Luxembourg
Monaco
Montenegro
Netherlands, The
Norway
Poland
Portugal
Prussia
Rumania
Rumelia
Russia
San Marino
Scotland
Serbia
Spain
Sweden
Switzerland
Turkey
Ukraine, The
Wales

HISTORY

Balance of Power
Balkan Wars
Bolsheviki
Charlemagne
Chivalry
Crusades
Eastern Question
Feudal System
Franco-German War
French Revolution
Holy Roman Empire
Hundred Years' War
Napoleon I
Nations, League of
Printing
Reformation
Renaissance
Roman Catholic Church
Seven Years' War
Succession Wars
Thirty Years' War
Triple Alliance
Triple Entente
World War

EURYDICE, *u rid′i see,* in Greek mythology, the wife of Orpheus. She died from the bite of a serpent, and Orpheus descended into Hades and gained her release by the power of his lyre. But Pluto agreed to her leaving only on condition that Orpheus precede her and refrain from glancing back. Orpheus consented, but, overcome with a desire to look upon his wife, turned, and Eurydice was drawn back into the region of the dead. The story has been a favorite theme for artists both Greek and modern.

EUSTACHIAN, *u sta′ki an,* **TUBES,** a pair of tubes belonging to the apparatus of the ear. They are so called from their discoverer. In man these tubes are about an inch and a half long, and have walls of cartilage, bone and fibrous tissue. They proceed from the inner side of the cavity of the middle ear (see illustration, accompanying Ear) and open into the pharynx. Through them air enters the cavity from the throat, and this aids in keeping equal the atmospheric pressure on each side of the drum membrane. When through any cause the Eustachian tubes become inflamed they are unable to transmit air to the cavity of the middle ear, and this condition produces head noises and partial or total deafness.

Bartolommeo Eustachio, *a oos tah′ke,* (?–1574), an Italian surgeon, whose discoveries in anatomy made him famous. To him anatomists are indebted, among other things, for the first accurate knowledge of the internal ear and its structure, of the development of the teeth and of the structure of the kidneys.

EU′TAW SPRINGS, Battle of, an important battle of the American Revolution fought September 8, 1781, about sixty miles northwest of Charleston, S. C., between an American force of 2,000 under General Greene and about an equal British force under General Stuart. The battle began about four o'clock in the morning with an engagement in which the Americans were victorious. Late in the day the British rallied and held their ground, but after the fight they retreated toward Charleston. This battle closed Greene's famous campaign in the South, by which he compelled the enemy to retire to Charleston, there to remain during the rest of the struggle.

EUTERPE, *u tur′pe,* in classical mythology, the Muse who presided over lyric poetry. The invention of the flute was ascribed to her, and she was usually represented as a virgin crowned with flowers, holding a flute in her hand.

EVANGELICAL, *e van jel′i kal,* **ALLIANCE,** an international association of Baptists, Methodists, Episcopalians, Lutherans, Presbyterians, Moravians, Independents and some others, organized in London in 1846. It was intended to bring the Christian churches closer together in work in which all Christian people are generally interested. The countries it represents are England, France, Germany, Ireland, Scotland, Switzerland and the United States. Branches are found in many of the British colonies. The American branch was organized in 1867. International conferences are held at intervals of from two to four years. The organization has done much to promote religious liberty and to break down denominational barriers in every country to which its influence has extended.

EVANGELICAL ASSOCIATION, a religious denomination, formed among the Germans in Pennsylvania in 1807. In its doctrines and church polity it very closely resembles the Methodist Episcopal Church. Owing to a difference of opinion in regard to methods of management, the organization split in 1891, one branch becoming known as the United Evangelical Church and the other as the Evangelical Association. A large percentage of the followers are of German extraction, though there is a considerable English-speaking membership. Besides the conferences in the United States there are conferences in Germany, Switzerland and Japan. Publications are issued in both English and German.

EVANGELINE, *e van′jel in,* a narrative poem in blank verse, written by Longfellow, and based on the expulsion of the Acadian peasants from what is now Nova Scotia, in 1755 (see ACADIA). It tells the history of two lovers, Gabriel and Evangeline, who were separated at the time the ships sailed away. For many years Evangeline wandered through cities and woodlands, searching for her lover, and she found him only on his deathbed. The following Lines indicate the theme of the poem:

Ye who believe in affection that hopes, and is patient,
Ye who believe in the beauty and strength of woman's devotion,
List to the mournful tradition still sung by the pines of the forest;
List to a tale in Acadie, home of the happy.

Evangeline was published in 1847, and was the author's first long narrative in verse. Longfellow was indebted to Hawthorne for the facts of the story. The meter used is dactylic hexameter, which is the form used in the *Iliad* and the *Aeneid.* The poem has been widely read, and is greatly admired for the stately beauty of its lines and the lofty sentiments it expresses.

EV′ANS, MARY ANN, or MARIAN. See ELIOT, GEORGE.

EVANS, ROBLEY DUNGLISON (1846–1912), an American naval officer, affectionately called "Fighting Bob," was born in Virginia and educated at the United States Naval Academy at Annapolis. During the Civil War he was present at both attacks on Fort Fisher, and in the second he was wounded. Returning to the service in 1866, he occupied various positions until 1896, when he was put in command of the *Indiana.* During the Spanish-American War he commanded the *Iowa* and took a prominent part in the capture of the Spanish fleet off Santiago. In 1901 he was made rear admiral. In 1907 he commanded the American fleet in its tour around the world until it reached the Pacific coast of California, when he was relieved, having reached the age for retirement from active duty.

EV′ANSTON, ILL., in Cook County, on Lake Michigan, just north of the limits of Chicago and twelve miles from the center of the city. It is on the Chicago & Northwestern Railroad, and it also has electric railway connection with Chicago and the many towns to the north along the lake shore, including Kenosha, Racine and Milwaukee. The city is beautifully located and is exclusively a residence suburb of Chicago. Northwestern University, Garrett Biblical Institute, the Norwegian-Danish Theological School, Swedish Theological Seminary and Visitation Academy are located here, making the city one of the leading educational centers of the United States (see NORTHWESTERN UNIVERSITY). Evanston was settled about 1835 and was incorporated in 1890. Population, 1910, 24,978; in 1920, 37,215.

EV′ANSVILLE, IND., the county seat of Vanderburg County, on the Ohio River, 180 miles southwest of Indianapolis, on the Illinois Central, the Louisville & Nashville, the Southern, the Evansville & Terre Haute, the Chicago & Eastern Illinois and the Big Four railroads. Prominent buildings are a city hall, a court house, a Federal building, which has recently received a large addition, the state hospital for the insane and the United States marine hospital. There are sixteen private and parochial schools, a Carnegie Library and Willard Library. The city has three parks. There are furniture factories, a carriage factory, steam shovel works and a factory which manufactures iron store fronts. There is also a valuable trade in coal, grain, tobacco and flour. Evansville became the county seat in 1819, was chartered as a city in 1847, and reincorporated in 1905. Population, 1910, 69,647; in 1920, 85, 264, a gain of 22 per cent.

EVAPORATION, *e vap o ra′shun,* the change from a liquid or solid to a gaseous state. Wet clothes hung in a warm, dry yard soon become dry. Their moisture evaporates, or changes to vapor. A block of ice exposed to air, even in freezing temperature, also evaporates. Rivers, lakes and oceans in the same way lose their moisture, which changes to vapor and becomes a part of the atmosphere. By means of evaporation the earth's moisture, necessary for plant and animal life, is constantly being redistributed. Unless vaporization were constantly going on the earth would soon be a desert; most of the animal life would disappear, for without moisture the air would be unfit to breathe. Evaporation usually takes place rapidly at high temperatures; however, the amount of moisture already in the air determines the rate of evaporation. If wet clothes are continuously hung in a room without good ventilation the air will in time become so moist that it will take no more water; it is then said to be *saturated.* Saturation in the upper strata of the atmosphere results in rain. Wetness of air is called humidity.

EVARTS, **William Maxwell** (1818–1901), an American lawyer and statesman, born in Boston. He was graduated from Yale in 1837 and studied law at Harvard College. He was admitted to the bar in New York City in 1841, and rapidly rose in his profession. Evarts was at one time assistant district-attorney in New York City, was President Johnson's counsel in his impeachment trial, and was leading counsel for the United States in the Alabama Claims controversy. In the Hayes-Tilden contest he managed the case for Hayes before the Commission and was made by him Secretary of State. Evarts was elected to the United States Senate in 1885 and served until 1891, when he retired to private life.

EVENING SCHOOLS are maintained in cities in various parts of Europe and America. The European evening schools were probably the outgrowth of Sunday schools which, about the middle of the eighteenth century, added to their religious teaching instruction in the common branches. In most European countries at that time education was not compulsory, and these night schools enabled many children to obtain an education of which they would otherwise have been deprived. Night schools are now maintained in Germany, Switzerland and Great Britain at the expense of the state and are open to pupils of both sexes.

The evening schools in the United States began about 1850, and they now form a part of the educational system of nearly all large cities. Their sessions usually continue from November to March. Pupils are admitted without regard to age, nationality or previous education. The methods of instruction and subjects taught often differ widely from those in the day schools. Many pupils are foreigners and attend for the purpose of learning English. Newspapers are often used in the place of text-books, and in the best schools the greatest freedom is maintained between teachers and pupils.

The purpose is to adapt the teaching to the needs of the individual pupil and to enable him, during the time that he can attend the school, to obtain the greatest possible benefit. Arithmetic, writing, English, other common branches and commercial branches are taught. In large cities special institutions, such as the Drexel Institute in Philadelphia and Cooper Union in New York, maintain evening classes, in which instruction of a high order is given. The Young Men's Christian Association also maintains evening schools in most of the large cities. In these all branches are taught.

EVENING STAR, or **HES′PERUS**, the first star to appear in the western sky after sunset. When Venus is east of the sun it appears in the west as the first star of evening. When west of the sun, it appears as the last star of morning and then Mars, Jupiter and Saturn in turn appear as the evening star.

EV′EREST, **Mount**, the highest peak in the world. It is in the Himalaya range, on the southern frontier of Tibet, near the northwestern boundary of Nepal. It is approximately five and a half miles above sea-level, exactly 29,002 feet. Its height was estimated in 1841 by Sir George Everest, who was surveyor-general of Canada; in his honor it was named.

EV′ERETT, **Edward** (1794–1865), an American statesman, born at Dorchester, Mass., educated at Harvard College. He entered the Unitarian ministry, but resigned in 1815 and traveled in Germany and England, returning in 1819 to occupy the chair of Greek literature at Harvard. He became editor of the *North American Review* and, entering politics, became successively member of Congress, governor of Massachusetts and minister plenipotentiary to England. In 1845 he was appointed president of Harvard College and in 1852 became Secretary of State. He was then elected United States Senator as a conservative Whig, but resigned in 1854. In 1860 Everett was nominated for Vice-President by the Constitutional Union party. Shortly after, he retired to private life.

Everett was considered one of the greatest American orators. He delivered the principal address at Gettysburg, just preceding the brief address of Abraham Lincoln. Everett prophesied that the Lincoln address would live forever, while his own studied effort would quickly be forgotten.

EVERETT, **Wash.**, the county seat of Snohomish County, thirty-three miles north of Seattle, on Puget Sound and on the Northern Pacific, the Great Northern and a branch of the Chicago, Milwaukee & Puget Sound railroads. The city has an excellent harbor and a good coasting trade, and is in a productive agricultural, lumbering and mining region; copper, gold and silver are found. There are shipyards, iron works, paper mills, a smelter, and some of the greatest lumber mills in the northwest. Everett has one of the two plants in the United States which reclaim arsenic from smelter fumes. The town was settled in 1891, was incorporated two years later and has experienced a rapid growth on account of its natural advantages. In has a Carnegie Library, United States customs and assayer's offices and two hospitals. Population, 1900, 7,838; in 1910, 24,814; in 1920, 27,614.

EVERGLADES, *ev'er glaydz,* while referring to any low, swampy area, is the name applied particularly to a vast region of this nature in Southern Florida, 140 miles long and about fifty miles wide. Until recently no effort has been made in the way of reclamation, but in the belief that much of it could be made fertile a great state drainage project was inaugurated in 1913. So successful has been the initial work that large areas which were formerly lakes and marsh land now are under cultivation and produce fruit and vegetables. Florida appropriated $6,000,000 in 1913 to reclaim the Everglades, and it is believed that 5,000 square miles will be made habitable.

EVERGREEN, any tree or plant which stays green all the year. Most trees drop their leaves at least once a year, usually in the fall, and remain bare for months. Such are called deciduous trees (which see). An evergreen tree does not throw off its old dress until it has a new one; the new leaves push the old ones off. Evergreen leaves are tough and can stand a very low degree of temperature. In the case of cone-bearing evergreens, such as pines, the foliage has the form of needles. In warm climates some evergreens retain their leaves several years. Holly, ivy, boxwood and myrtle are the principal small evergreens of the North American continent,

EVERLASTING FLOWER, a name applied to several kinds of blossoms which do not fade. They are sometimes called *immortelles.* After the flowers open they dry out and become crisp without losing their form or color. The common immortelle is a button-shaped blossom in form not unlike a rose, but with tiny petals. The flowers never wither, but in time become so dry and crisp they fall to pieces.

EVOLUTION, *ev o lu'shun,* a term derived from the Latin for *unrolling,* and applied to the modern theory of the development of life forms. No longer does anyone believe that the trees and flowers are what they were ages ago, or that human creatures began as highly-civilized beings. Evolution teaches that there has been an unfolding or unrolling process from the earliest eras, and that all present forms of plant and animal life are the result of an orderly development according to natural law. This theory has received particularly strong support through advanced studies in geology. By examining the rock layers underlying the earth's surface, scientists have been able to read the earth's story from the present back to the first stages of life. Each layer of rock representing a past geological age, contains fossils of plant and animal life, and the complete series shows that the most complex organisms may all be traced to the simplest life form, the cell of protoplasm.

The most fascinating subject connected with this theory is the descent of man. Darwin, the father of the evolutionary theory, declared that man and the manlike apes are the offspring of a common ancestor, each group representing a branch of a single tree. Primitive man was not greatly different from the apes, but he had within him certain possibilities that the apes did not possess, the something that sets apart the human being from the brute. At one time many believers in Christianity could not reconcile the theory of evolution with the doctrines of the New Testament, but religious thinkers are coming more and more to accept it. They assert that the theory is correct in so far as it goes, but that there is a great controlling power which works through all things, and that evolution is the orderly working out of divine laws. See DARWIN, CHARLES.

EVOLUTION, in mathematics. See ROOT; ARITHMETIC.

EXCALIBUR, *eks kal'i bur,* in the legends of King Arthur, a miraculous sword which the king received from the hand of the Lady of the Lake. When he was about to die, after the "last, dim, weird battle of the west," Arthur commanded Sir Bedivere to fling the sword into the lake, an order obeyed by the knight after repeated commands. In the *Passing of Arthur,* one of Tennyson's *Idylls of the King,* the sword and its fate are described.

EXCAVATIONS IN ANCIENT LANDS. The peoples who inhabit the earth are constantly changing in their characteristics and modes of life. The earliest of them could not write, and these left not a word telling how they had lived. Later peoples wrote about themselves by engraving on the walls of buildings, caves and tombs, and on bricks and tablets of stone. In time all these peoples passed away from the face of the earth. Floods washed over their buildings and, subsiding, deposited upon them tons of débris; earthquakes razed walls and the wind drew over them a blanket of sand; volcanoes covered cities with lava and ashes. Not only the people themselves but all that pertained to them lay buried in great earthly sepulchres. Then other peoples flourished where these had lived, and they, too, passed away. A little of the history of ancient peoples has come down to us through successive generations, but this is comparatively slight. The written history that has come to us has not only been supplemented, but corroborated, by the extensive excavations in ancient lands made in the last hundred fifty years.

In the middle of the eighteenth century excavations made in Greece resulted in the unearthing of statuary and temples belonging to the fourth and fifth centuries B. C. In 1869 some excavators working in Asia Minor discovered the site of ancient Troy; others digging at Mycenae and Tiryns found remains of a very ancient Greek civilization known as the Mycenaean, which flourished between 1500 and 1100 B. C. Relics found on the Island of Crete point to a much older civilization, the Aegean, which probably flourished about 4000 B. C., while other remains found buried still deeper tell of a people who lived six thousand years earlier. Hoary indeed is this buried history, and yet it is not the oldest of which there is unwritten record, for discoveries of certain prehistoric remains in Germany, France, Spain and England have led archeologists to believe that a race of men inhabited Europe 100,000 years ago.

Among the most interesting relics disclosed by excavations have been those brought to light at Herculaneum and Pompeii (see these titles), the two cities buried by eruption of Vesuvius in the first century of the Christian Era. So complete was the preservation of these cities that scientists have been able to present a very good picture of the life that once flowed through them, and, by analogy, the contemporary life of other Italian cities. Excavations among the tombs of Egypt, and also in Assyria, Babylonia and Palestine, have revealed a wealth of material concerning the ancient inhabitants, interesting to Bible students no less than to the scientist. Among the most important excavations of recent times have been those conducted by Germans in Mesopotamia, where a history of Nebuchadnezzar and his people was found.

In America important excavations have been conducted and many valuable data concerning the life of the early Indians—Aztecs and Mound Builders—have been obtained.

EXCHANGE′, in commerce, that species of transactions by which the debts of individuals residing at a distance are canceled by written order, called a bill of exchange, or draft, without the transmission of specie. Thus, a merchant in Chicago who owes $500 for goods bought in New York, gives a bill, or order, for that amount, which can be offset through banking agencies, or otherwise, against similar debts owing by parties in New York to persons in Chicago. The creditor of Chicago is thus paid by the New York debtor and *vice versa,* and the expense and risk of transmitting money is thus obviated.

The process of liquidating obligations between different nations is carried on in the same way, by an exchange of foreign bills. Exchange is said to be *at par* when a bill drawn in New York for the payment of £100 sterling in London can be purchased there for £100. If it can be purchased for less, exchange is said to be *under* or *below par* and is against London. If the purchaser is obliged to give more, exchange is *above par* and is in favor of London. Although the thousand circumstances which incessantly affect the value of money prevent the ordinary course of exchange from ever being precisely at par, its fluctuations are confined within narrow limits.

EXCHEQUER, CHANCELLOR OF THE, in Great Britain the head of the Treasury Department. As the House of Commons holds the purse strings of England, the Chancellor must be a member of that body. The office may be held by the Prime Minister if he is a member of the lower house.

EXCHEQUER, *ex chek′er,* **COURT OF CANADA.** The exchequer court originally formed part of the Supreme Court, but in

1887 the two courts were separated. The name "exchequer court" carries us back to early English times. The king's treasury was in charge of a treasurer or "hoarder;" as the revenues increased in amount and as disputes arose in connection with their management, it became necessary to divide the duties into an administrative and a judicial department. When the English courts were formed, questions affecting the revenue were referred to the court called the *exchequer,* which derived its name, so we are told, from a chequered cloth which covered the table. The duties of the court grew in importance and were gradually extended to all suits in which the Crown was interested.

The exchequer court of the Dominion is presided over by one judge and has original jurisdiction in "all claims, suits or actions against the Crown." It also has jurisdiction in revenue cases and the enforcement of penalties, copyright, trade mark, and patent cases, and hears claims against the government when any person suffers injuries from or in the construction or operation of a public work. It hears all actions in which the Crown takes part in cases of receiver for or sale of insolvent railways, and in time of war it is also a prize court.

EXCISE, *ek'size,* **TAX,** any duty or tax levied upon goods, but a term particularly employed with respect to a tax upon goods manufactured, sold and consumed within a country, as opposed to a tax upon imports. See INTERNAL REVENUE SYSTEM.

EXECUTIVE COUNCIL, IN CANADA. The Executive Council is the name given to the body of men composing the administration of each province. The number and titles of ministers varies; broadly speaking, they correspond to the departments of the Dominion government. Each province has an attorney-general, who supervises the administration of justice and is the legal adviser of the government. Nova Scotia, whose agricultural interests are small, has no minister of agriculture, whereas Saskatchewan, whose mining interests are as yet not developed, needs no minister of mines. There is generally a treasurer or minister of finance, and there are officials at the head of the different departments of public works, crown lands, education, etc. All the members of the council who are departmental officers must vacate their seats if the assembly votes against them. All the conventions, furthermore, which govern the relations of the Governor-General and his ministers apply with equal force to the relations between a lieutenant-governor and his councillors.

EXECUTIVE DEPARTMENT, that branch of the government of a country by which the laws are carried into effect or by which the enforcement of them is superintended. The term is used in distinction from the *legislative* department, which makes the laws, and the *judicial* department, which interprets them (declaring the extent of their aim and their constitutionality). It includes the supreme magistrate, whether emperor, king, president or governor, his cabinet, or ministers, and a host of minor officials.

EXEC'UTOR, in law, one appointed by a person's last will to carry its provisions into execution after the testator's death. The testator may, by the common law, appoint any person of sound mind and discretion, except one disqualified by legal restrictions such as those affecting married women and minors. If no executor has been named by the testator, an administrator is appointed by the judge of probate. The duties of executor and administrator are the same. An executor is liable for any loss occurring to the estate through negligence, or for moneys paid to legatees before all debts are discharged. See WILL; DESCENT.

EXERCISE. See PHYSICAL CULTURE.

EX'ETER, the oldest continuously-inhabited city in England. It is in Devonshire, 173 miles southwest of London. It is typical of a large class of English towns, quiet, easy-going self-contained, picturesque. About it lies a fertile agricultural country; within its limits are numerous buildings which are monuments of its history. The cathedral, begun in 1112, is famous for the beauty of its architecture, particularly for its finely-decorated west front. It is the repository of many famous relics, among them an old Anglo-Saxon anthology. Remains of the castle of Rougemont are standing on the hill of Northernhay, which has been converted into a public park. The Guild Hall, a quaint structure of Elizabethan times, and parts of the wall erected by Ethelstan are among the show places. A canal connects Exeter with the Exe River at Topsham. Along the Exeter docks are caves cut in the cliffs for the storage of oils. Iron founding and the making of agricultural implements and paper are about the only manufacturing activities. Exeter was a British settlement long before the invasion of the Romans, who called it Isca Damnoniorum. Population, 1921, 59,608.

EXILE, *ek′sile,* banishment from one's native country by government authority. The term is sometimes applied to voluntary absence from one's native land for a period, or for life. Among the Greeks, exile was the legal punishment for murder; except in certain cases it there meant confiscation of property and forfeiture of all rights of citizenship. In Rome it was the punishment for several serious crimes, notably treason, arson and poisoning. In both countries the accused was at liberty to anticipate forcible expulsion by going voluntarily into exile. Exile as a form of punishment has fallen into disuse. The last country to condemn people to exile was Russia, under the czars, who sent thousands of offenders to Siberia, usually for political offenses.

EXODUS, *eks′o dus,* the second book of the Old Testament and of the Pentateuch (which see). It describes the deliverance of the Children of Israel from their Egyptian masters, their sojourn in the Wilderness and the organization of their formal worship. The book is in forty chapters. Many of its events are related in these volumes in the article BIBLE, subhead *Bible Stories.*

EXOGENOUS, *eks oj′e nus,* **PLANTS**, plants which grow from or on the outside; in other words, which grow by additions to their exterior. The term is less employed than formerly. They are now called *dicotyledons.* See BOTANY.

EXORCISM, *eks′or siz′m,* the casting out of evil spirits by the conjurer's art. An opinion once prevailed that persons afflicted with such disorders as insanity or epilepsy were possessed by evil spirits. Over such persons incantations were pronounced, in the belief that this would drive out the devils. There were even persons who made a regular profession of exorcism.

EXOTIC, *eks ot′ik,* in botany, a plant which is reared under different conditions of soil and climate than prevail in its natural habitat, and which requires especial care to be kept alive. Exotics from tropical lands are often seen in conservatories, in which artificial heat takes the place of tropical warmth. In a figurative sense an exotic is any rare thing which requires careful nurture.

EXPAN′SION, in physics, the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. This is one of the most general effects of heat, being common to all bodies, whether solid or fluid. The expansion of fluids varies considerably, but, in general, the denser the fluid the less the expansion; thus, mercury expands less than water, and water less than alcohol. Commonly, also, the greater the heat, the greater is the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of temperature. Water, in cooling, ceases to contract at 42° F., and it has its maximum density at 39.2° F. Just before it reaches the freezing point, 32°, it begins to expand again and expands more and more rapidly as the freezing point is reached. This expansion is about one-eleventh of its bulk, and accounts for the bursting of pipes and other vessels when water freezes in them.

EXPANSION, TERRITORIAL, OF THE UNITED STATES. See UNITED STATES, subhead *History.*

EXPECTA′TION, the value of the prospect of gaining some prize or property depending upon the happening of an uncertain event. A sum of money in *expectation* upon a certain event has a determinate value before that event happens. If the chances of receiving or not receiving a hundred dollars, when an event arrives, are equal, then before the arrival of the event the expectation is worth half the money. *Expectation of life* is the probable duration of the life of individuals of any given age. For further explanation of this phase, see MORTALITY, LAW OF.

EXPLORATION. See NORTH POLAR EXPLORATION; SOUTH POLAR EXPLORATION, and the references there given.

EXPLOSIVES are agents of destruction. They have their place in economic life, where they are made to perform beneficial work, and in warfare, where they are the agency of horror, suffering and death.

In economic life explosives are employed in mining, to loosen and crumble great masses of minerals so that miners can handle them easily; in agriculture, to remove stumps from land that is being cleared; in dredging, to remove solid obstructions, such as rocks, from a channel (see HELL GATE; PANAMA CANAL). The most common explosive for industrial uses is dynamite (which see). Ordinary gunpowder is not powerful enough for even ordinary purposes.

Warfare has developed the most powerful explosives of which the mind can conceive. They are employed as the bursting charge in projectiles. The most destructive is trinitrotoluol, commonly called T. N. T.; two other terrible agencies are guncotton and cordite. (These three are discussed in these volumes.)

Among those explosives which are less familiar are Atlas powder, dualin, giant powder, lithofracture, vigorite and Vulcan powder. These have nitroglycerine as a base, with varying proportions of sodium nitrate, sodium chloride, potassium nitrate, manganese, sulphur, barium nitrate, etc., as component parts. Nearly all of them are over fifty per cent nitroglycerine. See CANNON; HOWITZER; MORTAR.

EXPONENT. See ALGEBRA; POWER (in mathematics).

EXPOSITION, *eks po zish'un,* INDUSTRIAL, an exhibition on a large scale of the products of industry and art. National and international expositions of to-day, the outgrowth of the small fairs that were common in Europe in the Middle Ages, aim primarily to show the results of the most advanced ideas in all branches of the arts and industries and thereby promote progress and interest in these fields. In pursuance of their object they provide not only for industrial displays, but also for educational and fine arts exhibits and for various features to entertain and amuse visitors.

The most famous of national fairs is that held which has been held annually at Nizhni Novgorod, Russia. The fair usually opens the last week in July and lasts until the middle of September, but it has not been held since 1916. The first great French Exposition Universelle, opened at Paris in 1855, has been followed by numerous similar international events. The magnificent international exposition held at Chicago, Illinois, in 1893, to commemorate the four hundredth anniversary of the discovery of America, marked a distinct advance over all preceding expositions in picturesque architecture and landscape.

Most buildings erected for exposition purposes are torn down as soon as the exposition is over. Sometimes an exposition plan embraces a well built structure intended to be permanent. Such are the Eiffel Tower and handsome Alexander III Bridge at Paris, the Memorial Art Gallery at Philadelphia and the Art Gallery at Saint Louis. In all recent expositions much attention has been given to the securing of highly decorative effects in electric lighting and a harmonious color ensemble. The distinguishing feature of the Panama-Pacific Exposition was its color—a feature made possible by the use of plaster in numerous tints.

Related Articles. Consult the following titles for additional information:

Alaska-Yukon-Pacific Exposition
Centennial Exposition
Lewis and Clark Exposition
Louisiana Purchase Exposition
Pan-American Exposition
Panama-Pacific Exposition
South Carolina Exposition
Trans-Mississippi Exposition
World's Columbian Exposition

EX POST FACTO, *fak'toh,* **LAW,** a law which declares a deed to be a crime which was not a crime at the time it was committed. Such a law would reach backward in point of time and put a man in jeopardy for acts against which there was no law when he performed them. To illustrate: On January 1, assuming there is no legal restraint, a man whips his child in a cruel manner. On February 1 a law is passed which prohibits child beating, and it declares any offense of the kind occurring within a year past should come within the provisions of the statute. The father could then be punished for his action, although he had not violated a law when the deed was committed. *Ex post facto* laws are now unknown; in all enlightened countries they are expressly forbidden (see CONSTITUTION OF THE UNITED STATES, Art. 1, Sec. 8).

Such laws were the resort of tyrants in former days when they wished to put out of the way dangerous rivals or opponents who threatened their continuance in power.

EXPRESS COMPANY, a company or association which transports parcels for hire (see COMMON CARRIER). This business began in the custom of the stage driver of a former day who carried packages from one point in his route to another for a small consideration, but it was first introduced as a separate business in 1839. It eventually grew to immense proportions, and in addition to the delivery of parcels, it has extended its field to cover the issuance of checks, or money orders, similar to the postal money orders, the collection of debts and even the acceptance of deposits for safe keeping. By means of C. O. D. methods, that is, collection on delivery, goods are transported for merchants and delivered to consumers upon payment of the purchase price. The use of express money orders, or letters of credit, in foreign travel is becoming more common, perhaps, than any other means of carrying funds. In Europe the express business is generally transacted by the post-office departments of the governments.

In 1918, during the World War, in furtherance of plans to conserve man power, avoid duplication of service and to lessen mileage on government-controlled railways, the United States government took over the operation of America's four leading express companies and combined them into one gigantic concern, calling it the American Railway Express.

In Europe express companies on the American plan are almost unknown. The parcel post (which see) serves the people in the same capacity.

EXTEN′SION, in physics, that property of matter by virtue of which it occupies space. Even the minutest particle of matter has length, breadth and thickness. It is impossible to conceive of matter without these three dimensions. At first though we are apt to attribute only length and breadth to such bodies as a piece of tissue paper or of gold leaf. But this is a mistake, unless these bodies did possess thickness they could not exist as material objects. See MATTER.

EXTERRITORIALITY, *ex ter i toh ri al′i ti,* the doctrine that assumes that a man who is abroad on his country's diplomatic business is always on his native soil. In other words, a diplomatist carries his country with him. An American ambassador in London, sitting in his embassy, above which floats his country's flag, is assumed to be on United States territory, and wherever he goes in the British Isles the assumption continues in force.

A diplomat is not bound by the laws of the land to which he has been sent (although he scrupulously obeys those laws), but is under the laws of his own land. He cannot be called to account for a violation of foreign law, but the country to which he is accredited may ask his country to recall him.

This fiction of international law, called exterritoriality, arose out of the visits of the old-time kings of Europe to brother monarchs. A king could not lawfully leave his realm; even if he could do so it was unthinkable that on a visit to another realm he should bow to the superior authority of another king. So it was arranged that wherever a king set his foot that spot became a part of his own country so long as the foot rested thereon.

EXTRACTS, *eks′trakts,* substances used in cookery, in medicine and as perfumes. They are variously prepared. The lemon, vanilla, and other extracts used in cooking are fruit or vegetable juices from which most of the water has been allowed to evaporate. The beef juice of commerce is prepared by a process of which evaporation is an essential part. Extracts made from digitalis, aloes, camomile are used extensively in medicine. The plants are soaked in alcohol, which draws out the juices and then evaporates, leaving the essence. Some extracts from flowers are obtained by distillation; the best method, however, is that called cold *enfleurage.* In this method the flowers are placed upon pure lard spread upon glass plates; when the lard becomes saturated with the essence it is dissolved in alcohol, which is then allowed to evaporate, leaving the extract.

EXTRADITION, *ex tra dish′ un,* the delivery of a fugitive from justice by one country to another. The process is usually decided by treaties, specifying the crimes for which extradition is allowed; and usually extradition is neither asked nor granted when no treaty exists. Nations now generally refuse to surrender their own citizens for prosecution by foreign states, and they also decline to extradite men who are charged with merely political offenses. It has now become the general rule that the criminal who has been extradited cannot be tried except for the offense for which he was extradited.

Criminals are extradited from one state to another in the Union, and from one province to another in Canada, on the demand of the executive of the state or province from which he has fled; the legal process is known as *requisition.* An executive called upon thus to surrender a man may refuse to issue requisition papers, but usually the request is granted.

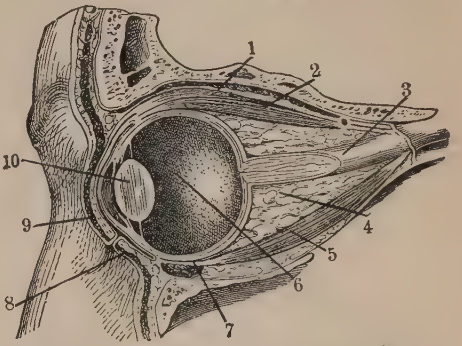
EYCK, *ike,* HUBERT VAN (1366–1426) and JAN VAN (1390–1441), two brothers identified with the revival of art in Holland. They lived first at Bruges, whence the younger brother is called John of Bruges, and afterwards at Ghent. They were among the first painters of Northern Europe to attempt to paint objects as they appear in nature. Jan

Van Eyck made many improvements upon his predecessors in linear and aërial perspective and in painting upon glass. The chief contribution which these brothers made to the Flemish School of painting was their revival of a process which prevented the paint from cracking. They painted chiefly religious subjects, figures of Biblical characters and dramatic scenes from Scripture. For the Cathedral of Ghent they did a series of panels representing *The Adoration of the Lamb,* their most ambitious work.

EYE, the organ of sight. Mankind has marveled at the invention of the camera, by which permanent records of landscapes, buildings, faces and countless other objects are made. Yet the eye, by which man obtains so many of his sense impressions, is more wonderful than the finest camera ever devised. To understand how it operates, one must know something of the way it is made. A study of its delicate apparatus, too, should impress one with the importance of taking care of the mechanism by which we view the world about us.

Parts of the Eye. The eye is a hollow ball filled with liquid and semiliquid substances. The walls forming the ball are arranged in layers, the outer one of which is a firm, tough tissue covering five-sixths of its surface, but not extending across the front. The part which can be seen is called the "white of the eye." This tissue is known scientifically as the *sclerotic,* and its function is to protect the eye and give it form. Continuous with this coat across the front of the eyeball is a transparent film known as the *cornea,* which bulges from the sclerotic like the crystal of a watch. It is sometimes called the "window of the eye." A dark membrane called the *choroid* lies inside the sclerotic. This membrane contains blood vessels which help nourish the tissues of the eyeball. As it extends forward the choroid joins another tissue called the *ciliary* body, which contains a muscle used in focusing the eye.

In front of the cornea, and joined to the ciliary body, is the *iris,* the circular colored part of the eye. It has a dark spot in the center called the pupil. The amount of light that enters the eye is regulated by muscles in the iris which make the pupil larger or smaller. When the light is bright the muscle contracts and makes the pupil smaller. For this reason, when a person goes from a brilliantly lighted room into a darker one, he cannot see objects till the pupil dilates and allows more light to enter. The *retina,* an expansion of the optic nerve, lies under the choroid and terminates near its edge. It is made up of several layers of nervous tissue. The point at which the optic nerve enters the eye forms the *blind spot,* because the nerve fibers here are not sensitive to light.

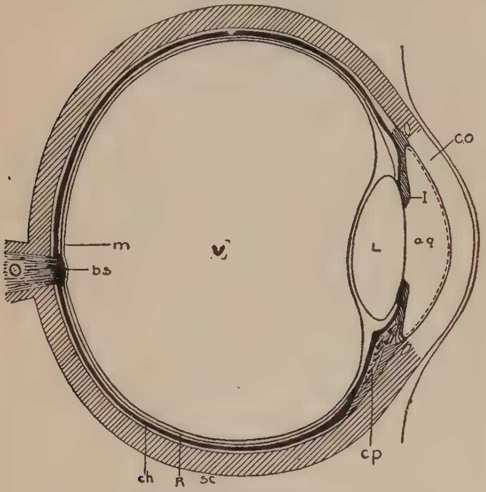


SECTION THROUGH THE LEFT EYE, CLOSED

1, lifting muscle; 2, upper straight muscle; 3, optic nerve; 4, fatty cushion; 5, lower straight muscle; 6, vitreous humor; 7, lower cross muscle; 8, lower eyelid; 9, upper eyelid; 10, crystalline lens.

Directly behind the cornea and in front of the iris there is a space filled with a watery liquid called the *aqueous humor.* Back of the iris is the *crystalline lens,* the body which permits the eye to accommodate itself to objects at varying distances. This lens, in adults about one-third of an inch long and one-fourth of an inch thick, is inclosed in a capsule, or bag. It looks like clear glass, and is held in place by the *suspensory ligament,* made up in part of the *hyaloid* membrane and in part of fibers from the ciliary processes. The lens is that part of the eye that does most toward bringing the rays of light to a focus. Back of the lens and in front of the retina there is a substance about the consistency of thin jelly, called the *vitreous humor.*

The Act of Seeing. Light travels from luminous bodies to objects in space in waves called rays. When the eye rests on an object the light rays from the object strike the cornea, and pass through it to the chamber containing the aqueous humor. From there it passes through the pupil, the crystalline lens and the vitreous humor. These bodies bend the rays until they are brought to a meeting place on the retina, and on this layer is formed a small picture of the object looked at. The optic nerve then receives the picture and carries it to a special center in the brain, where it is interpreted. It is an interesting fact that though a distinct picture is conveyed to the brain by each eye, in the center of sight these pictures are united into a single image. A comparison of the eye and the photographic camera shows that in the latter the rays of light are reflected upon a sensitized celluloid film or glass plate, just as the rays that enter the eye are reflected upon the retina. In each the rays are brought to a focus by a lens. In the camera the focusing for objects at varying distances is accomplished by moving the lens backward and forward. In the eye the process of accommodation is brought about by changes of shape or curvature in the crystalline lens.



CROSS-SECTION OF THE EYE

Parts: co, cornea; I, iris; aq, anterior chamber of aqueous humor; L, lens; cp, ciliary process; sc, sclerotic coat; R, retina; ch, choroid; V, vitreous body; m, yellow spot; bs, blind spot; O, optic nerve.

THE EYEBALL IN SECTION

Co, cornea
Sc, sclerotic
Ch, choroid
Cp, ciliary processes
I, iris
R, retina
O, optic nerve
bs, blind spot
m, yellow spot
L, crystalline lens
aq, aqueous humor
V, vitreous humor

Most diagrams of the eye omit the yellow spot. When the retina is looked at from in front two small marks may be seen on it. One of these is an oval depression about three millimeters across, of a yellow color, and is known as the yellow spot. It is situated directly in the horizontal axis from front to back and is the point of acutest vision. To one side and a little below is the blind spot.

The Eyelids. The eye is protected by lids formed of soft tissue made firm by a tough material called cartilage. As a further pro-

Outline of the Eye

- I. General Description
  - (1) Position
  - (2) Function
- II. Anatomy
  - (1) Eyeball
    - (a) Coats
      - (1) Sclerotic and cornea
      - (2) Choroid
      - (3) Retina
    - (b) Iris
      - (1) Pupil
    - (c) Humors
      - (1) Aqueous
      - (2) Vitreous
      - (3) Crystalline lens
    - (d) Arteries and veins
    - (e) Muscles
  - (2) Eyelids
    - (a) Skin
    - (b) Muscles
    - (c) Eyelashes
    - (d) Mucous membrane
  - (3) Lachrymal glands and canals
- III. Defects and Diseases
  - (1) As a double organ
    - (a) Lack of association in movement
    - (b) Difference in focus
    - (c) Nearsightedness
    - (d) Farsightedness
    - (e) Color blindness
  - (2) Each as a single organ
    - (a) Conjunctivitis
    - (b) Tumors
    - (c) Inflammations of the cornea
    - (d) Scleritis or inflammation of the sclerotic coat
    - (e) Cataract
    - (f) Glaucoma
  - (3) As a result of other diseases

Questions on the Eye

What is the shape of the eyeball?

What is the sclerotic? Cornea? Choroid? Iris?

What is the pupil?

A person going from a brilliantly lighted room into a dark one cannot see anything at first. Why?

How is the amount of light that enters the eye regulated?

Where is the blind spot?

tection each lid is fringed with fine short hairs. These lashes help to prevent the entrance of dust. If particles of dirt happen to find their way to the eyeball the sensitive membrane at once sets up a disturbance in the involuntary muscles of the lids, which move up and down and usually work the foreign particle to the corner of the eye and out. Ridding the eye of an offending particle is facilitated by the moisture supplied by the *lachrymal gland,* an oval gland the size and shape of an almond situated at the outer and upper part of each eye socket. Moisture from this gland, which is also the source of tears, keeps the surface of the eyeball constantly washed and drains through a duct into the nasal passage. Between the hairs are glands that secrete an oily substance which keeps the eyelids pliable and prevents the tears from running over them, except in crying. The eyelids are lined with a delicate, very sensitive mucous membrane, which is reflected over the front of the eyeball.

Care of the Eye. The crystalline lens is subjected to severe strain in the ordinary routine of life, and it should not be unnecessarily taxed. One can lessen the demands made upon it by abstaining from reading in a poor light, or on a moving train. It is also definitely established that viewing moving pictures at too short a distance from the screen is hard on the eyes, if the practice is indulged in to excess.

When the eyes are tired they should have rest like other parts of the body. Many eye diseases are acquired through carelessness in regard to hygiene. No one should ever wipe the face on a public towel, or touch the eyes with dirty hands. Signs of eye trouble are warnings that should be heeded. If there are evidences of strain, failing vision or trouble of any sort a competent oculist should be consulted. Properly-fitted glasses may save the wearer from ultimate blindness.

Related Articles. Consult the following titles for additional information:

Astigmatism
Blindness
Camera
Cataract
Color Blindness
Conjunctivitis
Iritis
Lachrymal Glands
Lens
Light

EZE′KIEL, meaning *God will strengthen,* was one of the four greater prophets mentioned in the Old Testament, author of the book that bears his name. He was the son of a priest and was carried away captive by Nebuchadnezzar, when the latter captured Jerusalem, probably about 597 B. C. Ezekiel dwelt by the river Chebar, a branch of the Euphrates, and commenced to prophesy about 592 B. C., continuing for about twenty years. The book of *Ezekiel* divides itself into two parts; the first, including chapters I–XXXIX, contains the prohecies delivered before and after the destruction of Jerusalem; the second, chapters XL–XLVIII, contains a vision of Israel restored.

EZ′RA, a Jewish scribe and priest, called the "true founder of Judaism." Brought up in the time of the captivity at Babylon, in his day the center of Jewish wealth and culture, and moved to pity for the Jewish community at Jerusalem, he conceived the idea of infusing new life and new ideals into it by going over with a band of zealously religious Jews from Babylon on a mission of reform. He enlisted the aid of Artaxerxes I, about 458 B. C., and was invested with authority for his purpose. "Ezra invested the Jewish law with a sanctity and influence it had never before possessed and made it the possession of the entire community and endowed the Jewish people with a cohesive power which was proof against all attacks from without." According to Josephus, Ezra died in Jerusalem; others say he returned to Babylon and died there at the age of 120 years. His mission to Jerusalem occurred at the time of Nehemiah's governorship.

F

F, the sixth letter of the English alphabet, the sound of which is formed by pressing the upper teeth on the lower lip and allowing the breath to escape between them. The sound is distinguished from that of *v* in that it is pronounced with the breath instead of the voice. In form the letter F is the same as the ancient Greek digamma, which was probably sounded like our *w*.

In music, F is the fourth note in the major scale of C.

FA'BIUS, an ancient and renowned family of Rome. Among its celebrated members were FABIUS MAXIMUS, whose policy of defensive warfare was so successful against Hannibal in the second Punic War, and FABIUS PICTOR, who lived about the same time and was the earliest Roman historian. He was known as "Fabius the Delayer," and because of his masterly strategy in retreat, holding back the enemy meanwhile, George Washington was called the "American Fabius."

FA'BLE, in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, in which animals and sometimes inanimate things are made to act and speak with human interests and passions, for the purpose of pointing a moral. The fable consists properly of two parts—the symbolical representation, and the application, or moral, which must be apparent in the fable itself. The oldest fables are of Oriental origin, and among these the Indian fables of Pilpai, or Bidpai, and the fables of the Arabian Lokman, are celebrated. Among the Greeks, Aesop was the master of a simple but very effective style of fable. The fables of Phaedrus are a second-rate Latin version of those of Aesop. In modern times Gellert and Lessing among the Germans, Gay among the English and Kryloff among the Russians are celebrated; but the first place among modern fabulists belongs to the French writer La Fontaine.

The following is a typical fable by Aesop:

The Donkey in the Lion's Skin

A Fable

A donkey, having found the skin of a lion, put it on, and, going into the fields, amused himself by frightening all the animals he met. Seeing a fox, he tried to alarm him also. But Reynard, perceiving his long ears sticking out, and hearing his voice, at once knew who it was. "Ah!" said he, "I should have been frightened too, if I had not heard you bray."

MORAL—It is not wise to judge a man by the coat he wears.

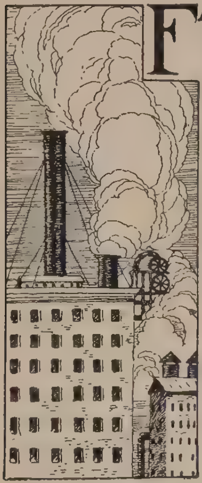
FACADE, *fa sad'*, or *fa sade'*, the face or front of a building viewed from without. It usually contains the principal entrance. When applied to the faces other than the front of a building, it is used with a qualifying term, as *rear facade, lateral facade, court facade.*

FACE, *fase*, THE, the front part of the head, including the forehead, eyes, nose, mouth, cheeks and chin. Exclusive of the thirty-two teeth, it is composed of fourteen bones, all but two of which, the lower jaw and the *vomer*, which separates the nostrils, occur in pairs. The two bones of the upper jaw carry the upper teeth and form most of the hard palate separating the mouth from the nose. The two *palate* bones complete the hard palate. The two *malars* are the cheek bones. The two *nasal* bones form the bridge of the nose. The two *lachrymals*, or *tear bones*, lie between the eye sockets and the nose. The two *turbinated* bones form the outer wall of the nostrils. Of all these bones only the lower jaw is movable, being articulated with the base of the skull. In brutes the jaws project much more than in men and form the prominent feature of the face, while the forehead recedes. See SKELETON.

FACES, FALSE, pasteboard or cloth masks representing human faces. They are used either as a protective screen or as a disguise. Hollow papier-maché masks which are caricatures of the human face are much enjoyed by children at Halloween. They are worn also at masquerades. See MASKS.

FACIAL NEURALGIA, *fa'sh'l nu ral'je ah.* See TIC DOULOUREUX.

FACTOR, *fak'tor.* In arithmetic factors are numbers which when multiplied together produce a given number. Every number has two factors, itself and 1, and many numbers have other factors. For example, 28 equals 28 times 1, and it also equals 7 times 4, or 7 times 2 times 2. When a number, such as 7, has no factors except itself and 1, it is said to be a *prime* number; a number having factors besides itself and one, as 28, is said to be *composite.* In algebra the factors of a given quantity are the expressions which when multiplied together produce it; for example, the factors of $a^2 b^2 = a, a, b$ and b. Factoring is the process of separating a number into its factors.



FACTORY AND FACTORY LEGISLATION. A factory in its modern sense is an establishment in which several persons coöperate to produce a commodity, the process of manufacture being divided into several stages, each of which is the special work of a separate class of laborers. The development of the factory system has its foundation in the principle, which is now well established, that economy of time, effort and financial expense and an advantage in the quality of production arise when several coöperate in the production of a complex article.

The Factory System Discussed. The benefits of the factory system have been enormous. The division of labor has resulted in a vast improvement in the quality of the article, in a great saving of time and, therefore, the lessening of price; this has led to an increased demand, which, in turn, has improved the demand for labor, raised wages, the standard of living and the general condition of working people. Its evils have been also numerous, but are less important than is usually believed. Women and children have doubtless been employed in greater numbers under the factory system than before; but their employment did by no means begin with the institution of the factory system. Insanitary conditions prevail in many factories; but they are not to be compared in their evil results with the conditions prevailing in sweatshops and tenement houses where manufactures are carried on.

The great subdivision of labor perhaps requires a somewhat lower grade of intelligence, since each worker is required to understand but a small part of the whole process of manufacture. However, the development of machinery has made necessary a deftness of movement and an alertness of mind which were never before required, and the gathering of many workmen together, with the consequent discussion of their needs and conditions, has stimulated the minds and raised the ideals of the workmen as a class. Perhaps the most important result of the factory system has been the widening of the gulf between capital and labor, since under the old household system of manufacture the capitalist was also the laborer, while under the new order, the two factors of production are not only centered in different persons, but their interests are necessarily growing farther and farther apart. It also causes the distinction between skilled and unskilled labor to be emphasized, to the benefit of the skilled workman and to the disadvantage of the unskilled workman. This probably causes the raising of the average of skill, since it leads many unskilled workmen to make effort to enter the classes above them.

Factory Legislation. Side by side with the development of the factory system has been the development of labor legislation, most of which has been directed to the improvement of the sanitary conditions of work and the protection of the health of the workers in factories.

This legislation has taken chiefly three directions: (1) the limitation of child and female labor, (2) the restriction of the hours of labor and (3) the improvement of the conditions of factory work. Most states now prohibit child labor, the age limit being placed variously at from ten to fourteen years. Many states limit, and some prohibit, work by adult women in factories or mines, and a vast majority now limit the hours of work, the average maximum probably being from fifty-five to sixty hours per week.

Trades unions have played an important part in securing these reforms and are now devoting their energies to the universal passage of laws limiting the hours of labor to eight in one day. In 1918 the United States Steel Corporation, the greatest private employer of labor in the world, placed all its men on the eight-hour basis. The efforts of labor unions have also aided in the accomplishment of another important reform, namely, the increase of the liability of employers for accidents to their workmen. All of these laws have required for their successful enforcement the institution of inspection systems. Inspection is now carried on in almost all states, with a view to bringing to court violators of factory laws.

Beginnings of the Factory System. The factory system first began to be important about the middle of the eighteenth century in England, when the inventions of Arkwright, Cartwright, Hargreaves and others led to the substitution of large and heavy machinery for hand labor with the small, simple tools which had been used previously. The system received a great impetus from the invention of steam power, which again increased the speed with which an article could be produced, caused a saving of labor and money and admitted of the establishment of manufacturing plants wherever conditions were most favorable. The next important step was the improvement in transportation facilities, and the last was the development of the patent system, by which the labors of inventors were protected and preserved to themselves, and the institution of labor-saving machinery was no longer opposed or its inventors persecuted.

The factory system was introduced into the United States about 1790 by Samuel Slater, but its development was slow until 1840. After that time, as population increased, the tendency to concentration of population increased, and the natural consequence was a development of coöperative effort in manufactures. This was vastly hastened by the development of electrical appliances.

Related Articles. Consult the following titles for additional information:

Child Labor
Division of Labor
Employer's Liability
Labor Organizations
Minimum Wage
Sweatshop System

FAHRENHEIT, *fah′ren hite,* Gabriel Daniel (1686–1736), a German physicist, distinguished chiefly for the improvements he made in the thermometer. As a manufacturer of meteorological instruments he made the experiment of putting mercury instead of alcohol into thermometer tubes and thus greatly improved the instruments. This led to the invention of a new scale of measurement, which was named for him. See Thermometer.

FAIENCE, *fa yaNs′,* a kind of glazed and painted earthenware. The name is derived from Faenza, a city of Italy, an important center of the Italian pottery industry at the time this ware was perfected. Faïence was made as early as the fourteenth century; the best specimens are those of the fifteenth, sixteenth and seventeenth centuries. The tiles of Della Robia, the pottery called Delft and majolica ware are finished by the faïence process. The pottery is covered with an opaque enamel, which is burned in a kiln, decorated, and then burned again.

FAINTING, or **SYNCOPE,** *syng′ko pe,* a sudden suspension of sensation and of the power of motion. It may be produced by loss of blood, pain, emotional disturbance or by organic or other diseases of the heart. The direct cause is the temporary checking of the heart action, resulting in a diminishing of the blood supply sent to the brain. A person fainting should be laid upon the back, with his head and shoulders slightly lower than his body, and his clothing should be loosened wherever it impedes circulation. Cold water may be sprinkled on the face and stimulating odors applied to the nostrils. Protracted cases need the advice and treatment of a physician.

FAIR, a meeting held for the purpose of selling goods or exhibiting the products of a country or of several countries. In the Middle Ages fairs were of great importance and were specially privileged and chartered by princes and magistrates, and public proclamation was made of their commencement and duration. Modern facilities for communication have much diminished the necessity for periodical markets. In Europe the most important fairs of the present day are those held at Leipzig and Frankfort-on-the-Main in Germany, at Lyons in France and at Nijni-Novgorod in Russia. These last are the largest fairs in the world. Fairs in the sense of markets are almost unknown in the United

States, but the term is usually given to bazaars or collections of the products of industry for public exhibition and competition.

FAIRBANKS, Alaska, next to Juneau the largest city in the territory, is 471 miles north of the sea at Seward and is to be the terminus of the new government railroad which will extend from Seward northward. The town is on the Tanana River, an important branch of the Yukon. It has now a short railroad extending about forty miles into the gold fields. Though but little south of the Arctic Circle, flowers and vegetable gardens flourish during the short summer. The town has a central steam-heating plant for stores and residences, electric lights and telegraph connection. Population, 1920, 1,155.

FAIRBANKS, Charles Warren (1852–1918), an American statesman and Vice-President, was born on a farm in Ohio, educated at Ohio Wesleyan University and admitted to the bar in 1874. He practiced law for a number of years in Indianapolis. In 1897 he was elected United States Senator from Indiana and was reëlected in 1903. In 1898 he was a member of the British-American joint high commission and chairman of the American commissioners to adjust fisheries disputes with Canada. In 1904 he was elected Vice-President of the United States on the Republican ticket, and in 1908 he was chairman of the American commissioners to the Quebec Ter-Centenary. In 1916 Fairbanks was nominated for Vice-President on the ticket with Charles Evans Hughes, but was defeated in the ensuing election. Fairbanks was probably the last Vice-President of the United States of whom it can be said that he was born in a log cabin.

FAIRFAX, Thomas (1692–1782), the sixth Baron Fairfax, was an important Virginia colonial. His father owned 6,000,000 acres of land in the colony—almost a fourth of all English Virginia. Thomas settled permanently in America in 1746. His younger brother, an earlier arrival, married his daughter to Lawrence Washington (brother of George), and this event brought Thomas Fairfax and George Washington into a close friendship, which even the Revolutionary War did not terminate, though Fairfax was a strong loyalist. His personal safety was assured and his property was not disturbed during the war. His home was near Winchester.

FAIRIES, small folks, existing only in the imagination, found in the lore of every nation, loved and believed in by children everywhere. One likes to think of fairies as Shakespeare conceived them in *A Midsummer Night's Dream:*

Over hill, over dale,
Through bush, through brier,
Over park, over pale,
Through flood, through fire,
I do wander everywhere,
Swifter than the moon's sphere;
And I serve the fairy queen,
To dew her orbs upon the green.
The cowslips tall her pensioners be:
In their gold coats spots you see;
Those be rubies, fairy favors.
In those freckles live their savors.
I must go seek some dewdrops here,
And hang a pearl in every cowslip's ear.

But, as every one knows who has tasted the delights of Andersen's and Grimm's *Fairy Tales,* not all fairies live among the flowers, with dewdrops for pearls. There are queer fairies that look like witches, akin to the fairy godmother whose wand turned Cinderella's ragged dress into a ballroom gown; there are good and evil fairies, and fairies that can turn into all kinds of different shapes. Each nation, too, has its own ideas as to what the fairy folk should be called.

In Northern Europe the fairies are divided into two races: the *elves,* graceful, sportive fairies who dance about the woods and often take a kindly interest in the affairs of human beings; and the *dwarfs,* or *gnomes,* who dwell underground and are the guardians of the jewels and metals hidden in the earth. They are for the most part somewhat malicious spirits, although their cleverness and their ability to forge wonderful weapons make them of great use to mankind if they can be induced to be favorable. A part of the dwarfs, known as *trolls,* live in the hills and often emerge to steal from men not only personal property but women and children. These little beings are regarded, not as immortal, but as living for a very long period.

Besides these spirits which inhabit the earth, there is supposed to be, by most

Northern nations, a class of *nixies,* water spirits, who, though not distinctly malicious, are very fond of enticing men or carrying them off by force to their caves in the sea. Among these nixies the most famous was the Lorelei, who from her cliff on the Rhine lured sailors to death by her beauty and the sweetness of her song. *Undines,* a sort of water spirits, are supposed to enter sometimes into various relations with human beings. If an undine marries a mortal and bears a child, she receives a soul. In Ireland, *pixies* are certain small beings into whom enter the souls of children who die unbaptized. In Ireland, too, as in Scotland, there is a belief in *banshees,* little old women who take up their abode in all houses of any importance and announce the death of a member of a family by wailing or by appearing in mortal form. Perhaps the most perfect ideal of the fairy type is the Persian *peri,* who lives upon perfume and tries by loving deeds to win an entrance to paradise, from which she is shut out by her lack of a soul.

Of course each nation adapts its fairies somewhat to its own customs. Thus, the Russian fairy is regarded as clad always in furs; the Chinese fairy wears a queue, and the Hindoo fairy has the wisdom of the Brahmins. English fairies are thought of chiefly in connection with the flowery fields and woods, about which they are supposed to dance on summer nights.

American children are especially fond of the Brownies and their more recent kinfolk, the Kewpies.

FAIRMONT, W. Va., chartered as a city in 1899, is eighty miles southeast of Wheeling, on the Monongahela River and on the Baltimore & Ohio and Monongahela River railroads. A state normal school is located here, and the city has a fine courthouse and a new Federal building, the latter built in 1914. There are extensive coal mines in the vicinity. Important industrial establishments include flour mills, foundries, planing mills, machine shops and glass works. The commission form of government was adopted in 1913. Population, 1910, 9,711, in 1920, 17,851, a gain of 84 per cent.

FAIR OAKS, Battle of, an important battle of the Civil War, which took place during the Peninsula Campaign, about seven miles east of Richmond, Va. The battle was fought on May 31 and June 1, 1862, between a force of about 42,000 Federals from the Army of the Potomac under General McClellan, and about an equal force of Confederates, under generals Joseph E. Johnston and G. W. Smith. After Johnston's retreat from Williamsburg toward Richmond, McClellan followed him leisurely, and upon reaching the Chickahominy River sent two corps of his army to the south side of the stream. Johnston immediately decided to attack this force before it could be reënforced or could recross the river. The attack was begun May 31 about 1 p. m. by General Longstreet. McClellan ordered a force under Generals Sedgwick and Sumner to cross the river to relieve the sorely-pressed brigades. About the middle of the following day, Lee, who had succeeded Johnston in command of the Confederates, withdrew toward Richmond. The loss of the Confederates was about 5,200; of the Federals, slightly less.

FAIRWEATHER, Mount, one of the highest mountains of the North American continent, in the southern part of Alaska near the Gulf of Alaska. The height of the peak is approximately 14,900 feet. The summit is crowned with perpetual snow.

FAITH CURE, a term applied by psychologists to the healing of bodily ills through mental action. It is also used in a restricted sense to define the cure of disease through prayer and the exercise of religious faith. The sect founded by John Alexander Dowie (which see) lays great emphasis upon divine healing, and it is an important part of the creed of several other religious bodies. The visiting of shrines, touching of relics and similar practices are other phases of faith cure.

FAKIRS, *fa'kurz,* or *fa keerz',* a word originally meaning *poor men,* fanatics, met with chiefly in India and the neighboring countries, who retire from the world and give themselves up to contemplation. They are properly of the Mohammedan religion, but the term is often used for a mendicant of any faith. They are found living both in communities and in solitude. The wandering fakirs gain the veneration of the lower classes by absurd penances and self-multilations. The word in America means impostors, or pretenders.

FALCON, *faw'k'n* a hawk famous for its strength, symmetry and remarkable power of flight. Its claws are sharp and hooked, its short, stout legs are heavily feathered and its curved beak is armed with a sharp point. The peregrine falcon was the one most used in hunting game (see below), but there are several other species that are almost equally powerful and graceful. The Greenland falcon is one of the best-known.

GREENLAND FALCON

Falconry, or Hawking, is the pursuit of game by means of trained falcons or hawks. The birds are trained to seize their prey and return with it to their masters. In the Middle Ages falconry was the favorite sport of princes and nobles; and, as ladies could engage in it, it became very prevalent. In Germany Henry the Fowler and the Emperor Frederick the Second were much addicted to this sport, the latter having written a work on falcony. In France it reached its height under Francis I, whose grand falconer had under him an establishment of fifteen nobles and fifteen falconers, costing annually about 40,000 livres. In Britain it was practiced among the Anglo-Saxons, but grew still more in favor after the Norman Conquest, only to decline in the seventeenth century, when firearms came into general use. However, it has never wholly died out in Europe.

CARDINAL FALCONIO

FALCONIO, Diomede (1842–1917), an American Roman Catholic cardinal. Although born in Italy, he emigrated to the United States at the age of twenty and nearly his entire life was spent there. This fact entitled him to recognition by his Church as an American. He was ordained priest in Buffalo in 1866, but went in 1871 to Newfoundland, where he remained ten years. After that time he spent a few years in Italy in prominent positions in the Church, but in 1899 was appointed by the Pope first apostolic delegate to Canada, from which place he was transferred to Washington in a similar capacity in 1902. On November 27, 1911, Monsignor Falconio and Archbishops Farley and O'Connell were named by the Pope as American cardinals.

FALKLAND, *fawk'land,* **ISLANDS,** an island group belonging to Great Britain, in the South Atlantic Ocean, about 300 miles east of the Straits of Magellan. The group consists of two large islands, East Falkland and West Falkland, covering respectively about 3,000 and 2,300 square miles and a great number of smaller ones surrounding them. The total area is about 7,500 square miles. They are hilly and boggy, entirely destitute of trees, but covered with a variety of grasses very nutritive for sheep and cattle, the rearing of which is the principal industry. Fish and sea fowl abound. Wool, frozen meat, hides and tallow are the chief exports.

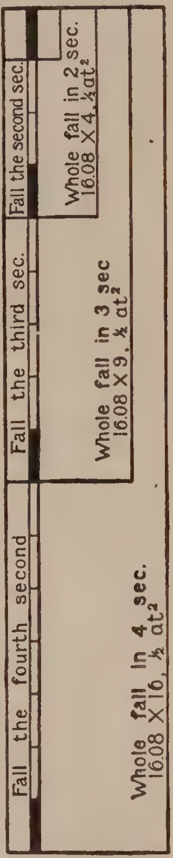
The Falkland Islands were discovered by Davis in 1592. Settlements were afterward formed on them by the French, Spaniards and English, alternately, but the latter retained possession of them. The colony has a governor and other officers appointed by the crown. Port Stanley, in East Falkland, is a thriving settlement. Near these islands in 1915 a naval battle was fought between English warships and German raiding vessels, in which the Germans were destroyed. Population of the group, in 1911, 2,272.

FALLIE'RES, *fah lyair',* Clement Armand (1841–), a French statesman, President of the French Republic. His political career began in 1876, when he was elected to the national Chamber of Deputies. He served in succession as Minister of the Interior, Minister of Public Instruction and Minister of Justice. In 1890 he was elected to the Senate, of which he became president when Loubet was elected President of the Republic. His election to the Presidency took place in 1906; his term ended in 1913.

FALLING BODIES. Any unsupported body will fall to the ground and will roll to the lowest spot near where it hits the ground before it comes to a position of rest. It does so because of the attraction of gravitation, which is a "pull" by which every particle of matter is attracted to every other particle of matter (see Gravitation).

A stone is attracted to the earth, and the earth is attracted to the stone. In the theory both bodies move towards each other; the smaller mass moves farther, for the attraction of the other mass, being immeasurably greater, overcomes that of the former and exerts the residue of its own powerful "pull" upon the other object. In falling, a body drops in a straight line directly towards the center of the earth.

In the air, bodies fall with unequal velocities; for instance, a piece of paper falls more slowly than a bullet, but this is because of the peculiar shape of the bodies, that of the paper being such as to receive much resistance from the air, while the bullet receives comparatively none. If a feather and a bullet or a piece of paper and a bullet are placed in a long glass tube, from which the air has been taken, they will fall with an equal velocity.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Fall the third sec.
Whole fall in 3 sec 16.08 X 9. ½ at²
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DIAGRAM ILLUSTRATING LAWS OF FALLING BODIES

FALL LINE. See COASTAL PLAIN.

FALL RIVER, MASS., an important manufacturing city of Bristol County, situated on the Taunton River, at its mouth on Mount Hope Bay, fifty miles south of Boston and on the New York, New Haven & Hartford Railroad. It is also connected with New York, Philadelphia and Newport by lines of steamers. There is a good harbor. The city is about eleven miles long and has an area of over forty square miles. It is well laid out and has a number of public parks. Among the notable buildings are the B. M. C. Durfee High School, the state armory, the post office and custom house, the city hall, Bradford Durfee Textile School, Central Congregational Church, Church of the Ascension, Saint Mary's Pro-Cathedral, Notre Dame Church, Saint Anne's Church and the public library, which has a collection of over 90,000 volumes. The leading educational institutions of the city are the Bradford Durfee Textile School, a conservatory of music, the Rogers and Allen's School and Notre Dame College. The charitable institutions include a Home for Aged People, Children's Home, Saint Vincent's Home, Saint Joseph's Home and a number of nurseries.

Fall River is one of the leading industrial cities in the United States, and there is an abundance of water power. The most important industries are those connected with the manufacture of cotton goods. The mills have over 4,000,000 spindles. There are also important manufactures of woolen goods, calico, ginghams, men's hats, knit goods, boots and shoes, spools and bobbins and foundry and machine shop products. The city has extensive bleaching works, carriage factories and rope and twine works, and there is an important quarry near. Fall River was formerly a part of Freetown, which was settled by people from Plymouth Colony; it was incorporated under its present name in 1803 and was chartered as a city in 1854. Population, 1910, 119,295; in 1920, 120,485.

FALSE IMPRISONMENT, the detention of a person without due process of law. If a person is confined as the result of perjury of another, such confinement is false imprisonment, and the perjurer may be punished. If one is forcibly detained in a room and deprived of his liberty, with ill intent on the part of his captors, the guilty parties are liable to subsequent arrest and punishment.

It is not a case of false imprisonment when a jury convicts an innocent man on a criminal charge, if the trial has proceeded in an entirely legal manner. Such an unfortunate victim, if later released, has no means of redress, although laws on the subject have been considered in many states.

FALSE PRETENSES, in law, is defined as false representations and statements, made with a design to obtain "money, goods, wares and merchandise" with intent to cheat. Conviction under such a charge may incur either a jail sentence or a fine, or both.

FAMILY, in biology, a group of plants or animals which have a common resemblance or connection. In the general scheme of classification the family is the group next higher than the genus (which see), and a family therefore consists of a group of genera. The Easter lily, the tulip, the trillium and the wild onion belong to the lily family; the bamboo, esparto, sugar cane and meadow grass to the grass family, the house cat, lion, leopard and tiger to the cat family, and so on. See BOTANY; ZOÖLOGY; CLASSIFICATION.

became private chamberlain to Pope Leo XIII. Seven years later he was made vicar-general of the archdiocese of New York. In 1895 he was auxiliary bishop of New York, in 1902 became archbishop, and in 1911 cardinal. Cardinal Farley was the author of several books on historical and religious subjects, including a *History of Saint Patrick's Cathedral* and a biography of Cardinal McCloskey.

CARDINAL FARLEY

FARM CREDITS. See RURAL CREDITS.

FARMERS' ALLIANCE. See POLITICAL PARTIES IN THE UNITED STATES.

FARMERS' IN'STITUTE, a meeting for instruction and mutual benefit of farmers. As ordinarily conducted, a farmers' institute consists of a three or four days' meeting, which is planned to reach the farmers of several adjoining towns. The meeting is usually conducted by one or more men who are experts in certain lines of agricultural work, usually working under state or Federal authority, and frequently the expenses are met by state appropriations. The conductors arrange the program, give talks on their specialties and invite general discussion from the farmers present. The evenings are usually devoted to popular lectures. In most states farmers' institutes are managed by the state board of agriculture, who employ a superintendent, whose business it is to organize the institutes, conduct or visit them as far as possible and see that the programs are beneficial to the farmers.

A feature which is the outgrowth of the farmers' institute is the moveable school of agricultural instruction, which goes from county to county, in charge of state agents. Another outgrowth of the same principle is the appointment of county agents, who reside in the county and give their time wholly to agricultural interests. These men are paid partly by the state and partly by the county.

FARNE, *fahrn,* **ISLANDS,** or **FERN,** *furn,* **ISLANDS,** a group of seventeen small islands, two to five miles off the northeast coast of Northumberland, England. Some of the islets are only visible at low tide and the largest, Farne, is only sixteen acres in extent. There are two lighthouses; one of them, on Long Stone Rock, was the scene of Grace Darling's heroism in 1838. See DARLING, GRACE.

FARNESE, *fahr na'sa,* an illustrious Italian family, which rose to prominence in the thirteenth century. The most conspicuous members were the following:

ALESSANDRO FARNESE, who became Pope Paul III in 1534; his grandson, ALESSANDRO (1547–1592), known as the Duke of Parma, who became a great general in the Spanish army and fought in the Netherlands; ELIZABETH FARNESE, wife of Philip V of Spain. The line became extinct in 1731.

Farnese Palace, one of the finest palaces in Rome, was erected by Pope Paul III (Alessandro Farnese). It was finished by Michaelangelo. The blocks of stone of which it is constructed were taken from the theater of Marcellus and from Colos. Most of the art treasures formerly contained in it are now at the Museum of Naples, but a few excellent works remain. The palace became the property of the ex-king of Naples, and is now the residence of the French ambassador to Italy.

Farnese Bull. This is a group of statuary dating from the second century B. C. It is based on the story of Antiope, a slave of Dirce. The latter ordered Antiope to be bound to the horns of a wild bull, and when the slave begged help from her two sons, they seized the cruel mistress and bound her to the horns. In the group the sons are depicted binding Dirce, while Antiope, in the background, looks on. The name of the statuary has reference to the fact that the group was for a time in the Farnese Palace. It is now in the Museum at Naples. The *Farnese Bull* is an example of the Rhodian school of sculpture, and it was excavated from the baths of Caracalla.

Farnese Hercules. This is a statue dating from the first century B. C. It, too, was excavated from the baths of Caracalla, and for a time was in the possession of the Farnese family. It is now in the Naples Museum. The statue, which depicts Hercules leaning on his club, represents the period of decline in Greek art.

FAROE, *fa'ro,* **ISLANDS,** a group of islands in the North Atlantic, lying between Iceland and Shetland. They belong to Denmark. The islands are twenty-five in number, of which seventeen are inhabited. The chief island, Strömö, is twenty-seven miles long and eight miles wide, and others are Osterö, Vaagö, Borö, Viderö, Sandö and Suderö. The entire area is 530 square miles. The coasts are steep and are indented with deep inlets. The islands are mostly of volcanic rock, and they are frequented by hurricanes. The inhabitants are chiefly engaged in fishing and the rearing of sheep. Thorshavn, in Strömö, is the seat of government. Population, 1916, about 19,000.

FARRAGUT, David Glasgow (1801–1870), the most famous naval officer of the Civil War. He was the son of an American Revolutionary soldier, who died when the boy was eight years old. David was subsequently adopted by David Porter, a famous naval commander, and it is significant that the boy was appointed a midshipman in the navy at the age of nine and a half. Though only eleven when the War of 1812 broke out, he accompanied his foster-father on a cruise in the *Essex,* and within a year was made prize-master of a captured vessel.

DAVID G. FARRAGUT

During the Mexican War Farragut held various positions of importance and for the four years after 1854 was employed in founding the Mare Island Navy Yard, at San Francisco. In 1861 he was assigned to go with the expedition against New Orleans, undertaken on the formation of the Confederacy, and sailed in February of the following year. New Orleans surrendered to the combined attack of the land and naval forces in April, and Farragut, after taking possession of Baton Rouge and Natchez and running the batteries at Vicksburg, joined the Union fleet above. In consequence of his success at New Orleans he was promoted to the rank of rear-admiral. In 1863 Farragut passed the batteries at Port Hudson and was of the greatest assistance to the land forces in the attacks on Port Hudson and Vicksburg. In August, 1864, he attacked the Confederate fleet in the Bay of Mobile and forced it to surrender, thus making the fall of Mobile merely a question of time. For these achievements Congress created expressly for him the grades of vice-admiral (1864) and of admiral (1866).

FAR'RAR, Frederick William (1831–1903), a writer, preacher and teacher, born at Bombay, India, and educated at the University of London and at Trinity College. In 1855 he was assistant master at Harrow and later was the head master of Marlborough College, which he made one of the first schools in England. He also served as chaplain of the House of Commons and was dean of Canterbury in 1895. He wrote many works of fiction, biography, philology and history. His *Life of Christ, Life of Saint Paul* and *The Eternal Hope* were written for the masses and were intended to raise religious thought to a higher plane.

FARRAR, *fahr rahr',* Geraldine (1882–), an American grand opera star of wide popularity. She was born at Melrose, Mass., where she received her public school education. After studying music in Paris and Berlin, she appeared professionally in 1901 at the Berlin Royal Opera House in the rôle of Marguerite, beginning then a very successful career. Later she became a favorite with American audiences, gaining much admiration for her portrayal of the soprano rôles in *Carmen, Madame Butterfly, Manon* and *Tosca.* She is a gifted actress as well as a charming singer. In 1916 Miss Farrar married an actor, Lou Tellegen. For a number of seasons after 1915 she devoted much of her time to acting in moving pictures. She was divorced in 1921.

FARTHING, the smallest English coin, made of bronze, in value the fourth part of an English penny, or in United States and Canadian values, one-half cent.

FASCES, *fas'seez,* bundles of wooden rods (usually birch) which were carried by lictors before the Roman magistrates as a symbol of their power to punish by flogging. Except in certain cases an axe projected from the middle of the bundle, signifying power to inflict death. The number of fasces and lictors varied with the dignity of the magistrate.

FASHION, *fash'un,* a term applied to those styles of dress which society adopts and imposes on its members. Details of men's and women's garments vary from season to season, and a few designers determine to a large extent what those changes shall be. The wearer must follow their decrees or else be set apart as out of style and old-fashioned. Paris is the world's most important center of fashion for women's clothing, and London for men's, but the adoption of any particular style is not always dependent on the whims of human pattern makers. In wartime garments of a military cut and color became popular, and such a widely adopted pleasure as automobiling has created new designs in veils, coats and bonnets. The community in which one unchanging style is worn indefinitely is the exception, but there are localities in Europe (Holland, for example) where the peasants cling to the fashions of their forefathers. See DRESS.

FASTS AND FASTING. The practice of going without food for definite periods is a very common religious observance. The Mohammedans fast between sunrise and sunset during their month Ramadan. A strict orthodox Jew fasts on the anniversary of a parent's death, on his birthdays after he is thirteen years of age, and on the birthdays of his first-born son till he is thirteen, besides observing the regular fast days. The Greek Church observes forty-eight days of fasting at Easter and thirty-nine at Christmas. Roman Catholics observe fasting rules during Lent and on certain fixed days.

Among the fast days appointed by Presidents of the United States were January 12, 1815; the last Thursday of September, 1861; April 30, 1863; the first Thursday in August, 1864; June 1, 1865; May 9, 1878; September 26, 1881.

The question of how long the body can endure total abstinence from food is an interesting one to scientists. Various warm-blooded animals are capable of living without food much longer than human beings. Cats and dogs have survived for several weeks without nourishment of any kind, and hibernating animals have lived several months, but it is probable that few human beings could survive such deprivation for more than a week. Death usually ensues after the fifth or sixth day, especially if there is a loss of four-tenths of the weight of the body. A person deprived of food but having access to water can ward off starvation for a much longer period.

FAT is found in all parts of the body except the teeth, bones and fibrous tissue. It is abundant in milk, in the marrow of bones and around various internal organs. It gives the human frame its smooth, rounded outline, and, since it does not readily conduct heat, is useful in retaining warmth. Fat aids the movements of certain organs, as the eye, the orbit of which is lined with this substance. The quantity of fat varies at different periods of life, being most abundant in the young and in middle life. As an article of diet fat is very important, and if the human body is deprived of it for any length of time a weakened condition results.

There are three classes of fats—hard, soft and liquid—represented respectively by (1) wax and human fat, (2) lard and butter and (3) oils.

FA'TALISM, the belief in fate, or an unchangeable destiny, to which everything is subject, and by which every act is predetermined. It must be distinguished from *determinism,* a doctrine fundamentally antagonistic. The determinist believes in the power of will to determine events; the fatalist does not accept the doctrine of free will.

FATA MORGÁNA, *fah'tah mor gah'nah,* the name of a peculiar mirage, occasionally seen in the Strait of Messina. The images of men, houses, towers, palaces, columns, trees and other objects are occasionally seen from the coast, sometimes in the water, sometimes in the air and often at the surface of the water. The same object has frequently two images, one in the natural and the other in an inverted position. The name means *fairy Morgana,* a fairy who was supposed by the ancients to cause the illusion. See MIRAGE.

FATES, or **PARCAE,** in Greek and Latin mythology, the three sisters who spin the thread of human life. The name Clotho, which means *the spinner,* probably belonged originally to all three, but as poets attempted to describe more precisely the function of each, separate names were assigned to them—

THE THREE FATES

Clotho, Lachesis and Atropos. Clotho spun the thread of life; Lachesis decided its fate, and Atropos with her great shears cut the thread.

FATHER, a title of reverence which has been bestowed upon several men of history who have been regarded in a sense as creators, or who have been severally associated with the beginnings of great movements. The following is a list of the important men who have been given this distinction:

Father of Angling. Izaak Walton, author of the Compleat Angler.

Father of Comedy. Aristophanes, the greatest of the Greek writers of comedy.

Father of English History. Bede, author of an Ecclesiastical History of the English People.

Father of English Poetry. Geoffrey Chaucer, whose Canterbury Tales gave English verse a standard literary form.

Father of Epic Poetry, a name commonly given to Homer.

Father of Greek Tragedy. Aeschylus, the first great writer of Greek tragedy.

Father of His Country. George Washington is the "Father of his Country" to Americans.

Father of History, a title given to Herodotus, the Greek historian.

Father of Medicine, a name given to Hippocrates.

Father of the Faithful, Abraham, the ancestor of the Jewish nation.

Father is sometimes used figuratively, as in the expression.

Father of Waters, applied to the Mississippi River. **Father of Lies** is a title given to Satan.

FATHER-LASHER, *fah′thur lash′er,* a fish from eight to ten inches in length, belonging to the sculpin genus (see SCULPIN). The head is large and is armed with several formidable spines. The fish is found on the rocky coasts of Britain and near Newfoundland and Greenland. In the latter regions it attains a large size and is a common article of food.

FATH′OM, a nautical term, first used in England, meaning six feet. The use of the word is restricted to measurement of the depth of water in the sea.

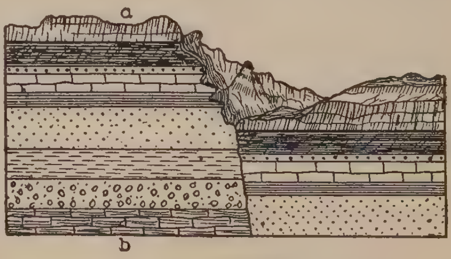
FATIGUE, *fa teeg′,* a depressed condition of mind or body following prolonged labor. The symptoms are familiar. Everyone knows what it means to be tired, and many have experienced the extreme of weariness—complete exhaustion. Fatigue may be felt in one part of the body, as the eye or muscles of the arm, or it may be felt generally.

The causes and effects of fatigue have engaged the serious interest of psychologists and physiologists. It is believed that the direct cause of physical fatigue is the accumulation in the body of poisonous waste matter which the muscles throw off while they are active. If the waste material collects faster than the blood can carry it away fatigue results. Anaemic and ill-nourished persons become tired easily because their blood is devitalized and unable to carry on its functions normally.

It is probable that the explanation for physical fatigue holds good for mental weariness, except that the brain seems to be able to stand intensive labor longer than the muscles. While the sensation of weariness is usually a safeguard, warning the individual not to drive his mind or body too hard, it is wise to avoid unnecessary fatigue. The man who is moderate in whatever he does, and who insists upon an adequate amount of rest and sleep, will reduce his periods of fatigue to a minimum and conserve his health.

FAT′TY DEGENERATION, *de jen ur a′shun,* a condition found in the tissues of the body, in which the health protoplasm is replaced by fatty granules. It is a sign of defective nutrition and is common in old age, affecting the muscles, the heart, the arteries, the kidneys and other organs. It is accompanied by great muscular flabbiness and want of energy, although the sufferer may appear fleshy and comparatively well.

FAULT, *fawlt,* wherever in the rock crust of the earth a deep crack has occurred from the surface downward the rock layers or strata have been displaced. The displacement along the plane of such a fracture is called a fault. The section *ab* in the illustration shows the strata in their original position, while the section to the right shows the sinking which caused the fault. Faults are frequently met with in coal beds, the miner often coming unexpectedly upon an abrupt wall of other strata. The angle this makes



A FAULT

with the plane of the bed he is working indicates whether he must look up or down for its continuation on the other side of the fracture. In mines faults often serve as natural drains.

FAUNA, *faw′nah,* a term used to designate the animal life of geographical areas or geological ages, as the word *flora* is used to designate plant life. Sometimes the region considered is small, sometimes very large; for instance, one may speak of the fauna of Cape Cod or of the fauna of North America.

FAUNS, rural deities or demigods, who, the Romans believed, inhabited the forests and groves. They resembled the satyrs and were said to have pointed ears, short horns, goat's tails and sometimes even cloven feet. In later times the fauns were considered to be more nearly human and were sometimes related to the animal world merely by pointed ears or horns. In the novel *The Marble Faun* Hawthorne brings into the story a famous marble statue of a faun in the Capitoline Museum at Rome.

FAURE, *fawr* FRANÇOIS FELIX (1841–1899), a French statesman, President of the French republic from 1895 to 1899. He took an active part in the Franco-Prussian War, and for his gallant services was decorated with the ribbon of the Legion of Honor. He became a member of the Chamber of Deputies in 1881 and later was under-secretary of state. On the resignation of Casimir-Perier in 1895, Faure was elected President. His administration was safe and conservative, but not brilliant.

FAUST, *fowst,* JOHANN (about 1485–about 1540), a German astrologer whose name has been connected with a well-known medieval legend. This story has been made immortal by Goethe's great drama *Faust,* and by the opera of the same name, composed by Gounod. The English dramatist Christopher Marlowe also made use of it.

According to the original story, Faust in his sixteenth year went to Ingolstadt and studied theology, attaining great distinction, but abandoned theology and began the study of medicine, astrology and magic, in which he likewise instructed his companion Wagner, the son of a clergyman at Wasserburg. After Faust had spent a rich inheritance, he made use of his power to conjure up spirits and entered into a contract with the devil for twenty-four years. A spirit called *Mephistopheles* was given him as a servant, with whom he traveled about, enjoying life in all its forms, but the evil spirit finally carried him off.

In the opera Faust is represented as an old man who sells his soul to the devil, receiving as a reward youth and beauty. He is tempted to make this bargain by a vision of the lovely Marguerite, whom he afterwards pursues to her ruin. At the close, Marguerite is carried to heaven while Faust is dragged to the lower regions by Mephistopheles.

FAUST, or **FUST,** JOHANN (?–about 1466), a German printer, the partner of Gutenberg, the inventor of printing with movable type. There are extant certain works which were published in the printing shop of Faust. The most famous publications which came from his press are the so-called Mazarin Bible and a psalter with beautifully illuminated initials, the first book published with complete dates. See PRINTING; GUTENBERG, JOHANNES.

FAWKES, *fawks,* GUY (1570–1606), an English conspirator. See GUNPOWDER PLOT.

FEASTS. See FESTIVALS.

FEATH′ERS, outgrowths from the skin of birds, which provide them with a covering that is both useful and attractive. A feather consists of a *quill* and a *shaft.* The quill is the lower part of the feather, and is a strong, round, horny stem. The upper part, or shaft, is filled with pith. On each side of the shaft is a web, composed of a series of regularly arranged fibers, called *barbs.* The barbs and shaft constitute the *vane.* On the edges of the barbs are set the *barbules,* which interlock with those of adjacent barbs and thus give strength to the vane. Feathers are generally divided into two kinds, *quill feathers,* found in the wing or tail, and *plumes,* or *clothing feathers,* generally distributed over the body.

The feathers of birds are periodically changed, generally once, but in some species twice, a year. This is called *molting.* When feathers have reached their full growth, they become dry, and only the tube, or the substance which it contains, continues to absorb moisture or fat. When, therefore, part of a feather is cut off, it does not grow out again; and a bird whose wings have been clipped remains in that situation till the next molting season, when the old stumps are shed and new feathers grow out.

The feathers of birds of beautiful plumage, such as birds of paradise, pheasants and egrets, have long been a valuable commodity of the milliner's trade, but public opinion is tending to restrict the slaughter of these birds for commercial purposes. It is illegal to import such feathers into the United States. Ostrich plumes (see OSTRICH) are very popular in some seasons, and there is no objection to their use, as the birds are not harmed when their plumes are removed. Feathers of domestic fowls are used as stuffing for bedticks, quilts and cushions.

FEBRUARY, the second month in the year. It has twenty-eight days, except in leap year (which see), when it has twenty-nine. In the old Roman calendar February had thirty days, but when Caesar added one day to July, the month named for him, he took one day from February, and it lost an additional day when Augustus added a day to August, his honor month. Its gem is the amethyst, and its special flower the primrose.

Special Days for Observance. Besides the notable birthdays occurring in February (see below), there is a special day of festivity, the fourteenth, called *Saint Valentine's Day* (see VALENTINE, SAINT). *Candlemas Day,* which falls on the second, is a Roman Catholic festival (see CANDLEMAS).

Anniversaries for Celebration. The following birthdays are worthy of observance:

Horace Greeley, February 3, 1811.
Sidney Lanier, February 3, 1842.
Zebulon M. Pike, February 5, 1779.
Dwight L. Moody, February 5, 1837.
Millard Fillmore, February 7, 1800.
Charles Dickens, February 7, 1812.
William T. Sherman, February 8, 1820.
Jules Verne, February 8, 1828.
William Henry Harrison, February 9, 1773.
John A. Logan, February 9, 1826.
Charles Lamb, February 10, 1775.
Thomas A. Edison, February 11, 1847.
Peter Cooper, February 12, 1791.
Abraham Lincoln, February 12, 1809.
Charles Darwin, February 12, 1809.
Winfield S. Hancock, February 14, 1824.
Galileo, February 15, 1564.
Susan B. Anthony, February 15, 1820.
Elihu Root, February 15, 1845.
Copernicus, February 19, 1473.
David Garrick, February 19, 1717.
William H. Prescott, February 20, 1726.
Joseph Jefferson, February 20, 1829.
George Washington, February 22, 1732.
James Russell Lowell, February 22, 1819.
Victor Hugo, February 26, 1802.
Henry W. Longfellow, February 27, 1807.
Raphael, February 28, 1483.

The following notable events occurred in February:

Meeting of the first Parliament of Great Britain and Ireland, February 2, 1801.
Victoria Cross instituted, February 5, 1856.
German National Assembly began sessions in Weimar, February 6, 1919.
Jefferson Davis chosen President of the Confederate States, February 9, 1861.
Marriage of Queen Victoria and Prince Albert, February 10, 1840.
Upper and Lower Canada reunited, February 10, 1840.
Spanish-American War closed by treaty, February 10, 1899.
Oregon admitted to the Union, February 14, 1859.
Yuan Shi-kai made first President of China, February 14, 1912.
Maine blown up in harbor of Havana, February 15, 1898.
Suez Canal first opened to ships, February 17, 1867.
Inauguration of Jefferson Davis, February 18, 1861.
Dedication of Washington Monument, February 21, 1885.
Beginning of exploration of the Upper Mississippi by Hennepin, February 28, 1680.

FEDERAL HALL, the building in which the first national Congress met in New York City and in which Washington was first inaugurated. The building was erected as a city hall in 1699, and was remodeled for the use of the national government. Federal Hall was torn down in 1836, and a sub-treasury was erected on its site.

FEDERAL HALL

FED'ERALIST, THE, a collection of eighty-five essays favoring the adoption of the Constitution of the United States, written by Alexander Hamilton, John Jay and James Madison and published by them in newspapers in 1788, over the signature *Publius. The Federalist* has been called "the political classic of the United States," and is considered the most important commentary on the Constitution. The historian John Fiske says that this series of papers had more to do with convincing the people of the wisdom of adopting the Constitution than any other single factor except Washington's influence.

FEDERAL PARTY, or FEDERALISTS, a name assumed by that party in the United States which favored the adoption of the Federal Constitution and sought to increase the powers of the national government, opposing the theory that the states should be given wider powers. They advocated a strong central government, operating upon the people directly. They came into power in 1789 with the election of Washington to the Presidency, but were defeated in 1801 and went out of existence about 1817. The Federal party was the forerunner of the National Republican, Whig and present Republican parties. See POLITICAL PARTIES IN THE UNITED STATES.

FEDERAL RESERVE BANKS AND BOARD. See BANKS AND BANKING.

FEDERAL TRADE COMMISSION, a United States government commission of five members, appointed by the President and confirmed by the Senate. It was organized in 1914. Under the act of Congress it was authorized to take over the Bureau of Corporations and continue the work of that former branch of the Department of Commerce. There is an administrative branch, a department of economics, an economic board of review and a law department.

The Commission makes frequent inquiry into business interests in the United States, secures full information as to existing conditions, suggests fundamentally safe measures for business houses to adopt, keeps business men informed as to possibilities of foreign trade, and makes suggestions to Congress respecting laws which it would be advantageous to enact for the benefit of the commercial world. It is empowered to investigate corporations and determine whether in their relations to other corporations they are violating any provisions of anti-trust legislation.

FEDERATED MALAY STATES, four Mohammedan states occupying the greater part of the Malay Peninsula. They are Perak, Selangor, Negri Sembilan and Pahang, and are under British protection. The officer administering the government of the Straits Settlements is *ex officio* High Commissioner for these states, but in each state the supreme authority is vested in the state council, which is presided over by the native sultan, who is assisted by the British resident. In 1909 the four native rulers entered into an agreement with the British governor of the Straits Settlements by which a federal council was created to consider matters of interest to all the states. This council meets once a year. The area and population of each of the four states is shown in the following table:

STATES	SQ. MILES	POP. 1911	HEADQUARTERS
Perak	7,800	494,057	Taiping*
Selangor	3,156	294,035	Kuala Lumpur
Negri Sembilan	2,550	130,199	Seremban
Pehang	14,000	118,708	Kuala Lipis†
The Federation	27,506	1,036,999	Kuala Lumpur

*The native capital is Kuala Kangsa.
†The native capital is Pekan.

The Federated Malay States are a source of cocoanuts, rice, rubber, sugar, tapioca and pepper. Timber, oils, resins, gutta percha and canes are important forest products. The cultivation of rubber and the mining of tin are the chief industries; from these states comes over half the world's supply of tin. Schools and hospitals have been established, there is postal, telephone and telegraph service, and railway construction is proceeding vigorously.

FEEBLE-MINDED, EDUCATION OF THE. Those unfortunate beings whose mentality is below normal need special training to prevent their being too great a burden to society and to themselves. Schools which care for mental defectives are found in all enlightened countries, and in the United States thirty-seven states have established such institutions. There are over 100 public day schools for the education of defectives, and about twenty-eight private schools. Altogether there are in the United States about 50,000 pupils being cared for in special schools for the feeble-minded. Similar institutions are found in the Canadian provinces.

In working out a plan of instruction for mental defectives, educators have to recognize that there are degrees of feeble-mindedness. The lowest class includes idiots, who are wholly lacking in the power of attention and self-control. The next class, the simple idiots, includes those whose minds never advance beyond the intellect of the seven-year-old child. Lastly come the imbeciles, who, though they are weak-willed and backward in many ways, can be taught to do useful work. None of the imbeciles has a mentality beyond that of the twelve-year-old.

The methods of instruction are similar to those employed in the best kindergartens and primary schools. The brightest of the pupils learn to read and write, and a few are capable of learning number as far as multiplication. However, the most beneficial work is of an industrial nature. The girls are taught all lines of housework and also fancy needlework, knitting, crocheting and embroidery. General exercises in music, calisthenics and military drill are used for the purpose of assisting the pupils to control their muscular movements and to work in harmony. The greatest patience on the part of the teachers is necessary, and those engaged in the work usually have special aptitude for it and devote their lives to it.

FEELING, the emotional element in consciousness. Feeling accompanies all mental acts and constitutes the personal element in them. It is the internal side of all mental activity and that which enables us to join the self to the outside world. It is through feeling that we recognize selfhood, or the difference between you and me. We can understand feeling only through experience. Unless a person has felt joy and sorrow, pleasure and pain, all the literature ever written upon these subjects could not make him understand them. Because feeling is such a strong personal element in mental activity, it is difficult to define, and nearly all definitions are vague and unsatisfactory.

Classification of Feelings. Feelings are divided into two classes, sensuous and ideal, or formal.

Sensuous Feelings. Sensuous feelings are those arising from certain physical conditions. They are often divided into two divisions, those arising from the general senses, such as hunger, thirst and fatigue, and known as organic, and those arising from the organs of special sense, such as the pleasure derived from viewing a beautiful picture or hearing a sweet melody, and called special. These feelings must not be confounded with sensations. Sensations furnish the stimuli which arouse the mind to action. We locate the sensation in the object which produces it. Feeling is in the self. I locate the tone of the piano in the instrument, not in the ear; but if I burn my hand on a hot iron, I locate the pain in the hand, and not in the iron.

Ideal, or Formal Feelings. Ideal, or formal, feelings are those which arise from mental states. In their highest form they are complex, specific, and exercised towards a special object, as admiration for a picture, love for one's parents. They are of two classes, egoistic and altruistic. The egoistic feelings are those which center within the self, and for this reason are often termed selfish. They should not, however, be confused with selfishness, as that term is ordinarily used. Selfishness means the advancement of the self without regard to the rights of others, but proper self-interests, such as self-respect and desire to improve, are essential to all other interests, and egoistic feelings of this sort are necessary to the right development of character. Altruistic feelings are directed towards objects outside the self, and when highly specialized and complex are termed emotions.

Quality of Feeling. Feelings are either pleasurable or painful. These qualities are intimately associated with the condition of the nervous system. Pleasure results from working off a surplus of nervous force and energy; children enjoy running and other muscular exercises for this reason. One also enjoys quietude after severe exercise.

Pleasure may be turned into pain. Exercise which in the beginning is enjoyable becomes painful after the system is fatigued. Even the sweetest music grows tiresome if persisted in too long. Pain may likewise be turned to pleasure. A review of one's experience will reveal the fact that many of the pleasures most enjoyed in adult life are results of what in the beginning were painful practices. Such are skating, riding a bicycle and performing other acts which were learned by effort so strenuous that it was often painful. Many people acquire a fondness for clams, oysters, olives and other articles of food by practice in eating them. When first eaten, these were usually far from enjoyable.

Intensity of Feeling. The intensity of feeling is affected by:

(1) The amount of stimulus. The burn from a red-hot iron is more painful than the sting of a mosquito.

(2) By the prolongation of the stimulus. The effect of a stimulus, which at first produces a keen sense of feeling, by long continuation is perceptibly diminished. Similar effects are produced upon mental states. Continual fault-finding, scolding or praise becomes tiresome and after a time has no effect upon those subjected to it.

(3) By change of stimulus. The feelings are intensified by changing the stimulus so as to excite one set of sensitive organs and then another.

The above principles apply almost entirely to sensual feelings. The intensity of ideal feelings depends largely upon the reverse of these principles. Usually, the longer we dwell upon an idea, the deeper the feelings to which it gives rise. One's love for one's parents, resentment of an insult or interest in a subject grows stronger the more one dwells upon the ideas which give rise to the feeling. Ideal feelings are often vivified by the imagination and are easily recalled by the memory, but they are in the last analysis dependent upon the sensuous feelings for their origin, as one's love for his mother or friends originates in the pleasure derived from their ministrations.

Culture of Feelings. The proper culture of the feelings is essential to one's development of a right character and to one's happiness. The child can be assisted in the cultivation of his feelings if those who have charge of his education will give heed to the following principles:

(1) During childhood feelings are narrowly egoistic and very intense. Their activity is not subject to the control of the will nor guarded by reason.

(2) Feelings strengthen with use. When one gives way to anger once, it is easier for him to do so again. Likewise, every time one controls his feelings under trying circumstances, he acquires increased power of self-control. Children should be led to acquire the power of self-control early. They should never be subjected to teasing or otherwise unnecessarily irritated. Such treatment often results in the formation of mental habits which are a hindrance through life.

(3) The intellectual feelings arise from the egoistic. The child's first desire for knowledge is aroused by what he sees others doing, for he wishes to possess the power which will enable him to accomplish the same results. If wisely led in fulfilling this desire, he gradually acquires a love of knowledge for its own sake, and study becomes a pleasure.

(4) The acquisition of knowledge is most satisfactory when the act is accompanied by feeling of a low degree of intensity. Strong emotion prevents careful reasoning; hence, the arousing of undue excitement under the name of enthusiasm is injurious to the work of the school and will seldom, if ever, be resorted to by a judicious teacher.

(5) The esthetic feeling, or love for the beautiful, is an important factor in the development of character and should receive early attention.

(6) The moral sentiment should be trained along with the intellectual and the esthetic. This is accomplished most successfully through concrete illustrations which appeal to the child's love and sympathy, such as fables and tales.

(7) The imagination and the feelings are very closely related. The child's imaginary joys or sorrows may be made to appear stronger than the realities.

(8) Happiness is the natural state of life, and nearly all our struggle is for the purpose of gaining happiness. The school and the home should be places of enjoyment, but the most thorough enjoyment is obtained through the wise and healthy use of all the child's powers. The school and home which give this sort of enjoyment contribute most to the child's welfare.

Related Articles. Consult the following titles for additional information:

Emotions	Psychology
Imagination	Sensation
Methods of Teaching	Will

FEE SIMPLE. A *fee,* in law, is an estate or inheritance in land; this is also the definition of fee simple, with the added significance that a fee simple is an estate belonging to a man and his heirs absolutely, to keep or to dispose of as they choose, without restrictions. It differs from a *fee tail,* which is an estate which can descend to "heirs of the body" only, or blood-relations. The latter is practically unknown in America.

FELDSPAR, *feld'spahr,* one of the most common minerals. It is a compound of silica and aluminum, in combination with soda, lime, or potash; thus there is a soda feldspar, lime feldspar and potash feldspar. Of the fifteen or more varieties, potash feldspar is the most common; it is called *orthoclase.* Another variety, called *labradorite,* contains beautiful blue crystals. The variety called *anorthite* is pink; *microcline* is green, and *albite,* white. One variety is called *moonstone,* because of its pale luster. It is feldspar which gives granite its peculiar color when polished.

In some form or other feldspar constitutes the principal part of all igneous and metamorphic rocks (see IGNEOUS ROCKS; METAMORPHIC ROCKS), such as granite, gneiss, porphyry and greenstone. It is not quite so hard as quartz. See GRANITE.

FEL'LAH, an Arabian word meaning *peasant,* used to designate any one of the laboring class in Egypt. The fellahs, or *fellahin,* constitute about three-fourths of the population of Egypt and are mostly the direct descendants of the old Egyptians, although both their language and religion are now that of their Arabian conquerors. They live in rude huts by the banks of the Nile and have suffered much from overtaxation and oppressive rule. Under British rule their condition is gradually improving.

FELLOWSHIP. In some universities graduate students of limited means yet of marked proficiency are allowed an annual sum of money to enable them to continue their studies. Most of the money which forms this foundation, or fellowship, comes from personal gifts or bequests, or is appropriated from the university funds.

In America the average amount given to a student is $500 a year. Fellowships in English colleges commonly range in value from about $750 to $1,500 a year, and they all confer upon their holders the right to apartments in the college and certain privileges as to commons, or meals. Fellowships are held for six or seven years, though the term may be prolonged in certain circumstances. Fellowships in the United States are usually for one year, though the student may be reëlected.

FEL'ONY, an offense punishable either by death or by imprisonment in a prison or reformatory. It is so defined in state statutes, though there is no definition of the word in the Federal laws. In general, whatever is a felony under the English common law is a felony in the United States. See CRIME.

FELT, a kind of cloth made of wool or of wool and fur matted together, with the aid of moisture and heat, by rolling, beating and pressure. The materials to be felted are carded, are placed in a machine where they are kept moist and are mixed together by a process of beating. They are then passed between rollers, subjected to pressure and united into a compact mass. Feltmaking is supposed to have originated in Western Asia, and the best qualities are still made in Persia and neighboring countries. Felt is now in general use for hats, clothing, upholstering, carpets and many other articles. Because of its being a nonconductor of heat, it is much used for roofing, sheathing hot-water reservoirs and the like.

FE'MUR, the long bone that forms the skeleton of the thigh. See SKELETON.

FENCING, *fens'ing,* the art of handling a sword or rapier for attack or defense, or an imitation of it, practiced with foils for sport. The practice is an old one, for it became common in Italy in the sixteenth century. In France, in the time of Louis XIII, killing by this means was a favorite pastime of the nobility. The small sword, or rapier, adopted for dueling, had a point but no edge, and demanded the highest degree for adroitness in its use. Dueling as a means of settling disputes lasted for centuries, but to-day duels are rare.

Fencing with light weight swords is a favorite form of exercise in gymnasiums. It promotes agility, develops muscular control and gives to the fencer a good bodily poise. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and the blade, which is made of pliant steel and has a rubber button at the end in place of a point.

FENELON, *fa n'lohN',* FRANÇOIS DE SALIGNAC (1651–1715), an eminent French educator, born in the Province of Perigord and educated at Plessis College, Paris and at the Seminary of Saint Sulpice. In 1678 he was placed at the head of a school founded to protect and to convert to Catholicism the orphan daughters of Huguenots. This led him to give special attention to the education of women and to write a treatise on *The Education of Girls,* which was the first systematic work of its kind ever prepared. It was a plea for the general education of women, particularly in the subjects and arts which should fit them for the home and other spheres that women at that time were expected to fill. Fenelon believed that only as women are educated could the moral and educational standard of the community be raised. He therefore considered the education of girls as essential as that of boys. Of his writings the most important are *The Adventures of Telemachus,* a sort of romance narrating the wanderings of Ulysses' son; *Maxines of the Saints, The Temporal Power of the Medieval Popes,* and *The Education of Girls.*

FE'NIANS, an organization of Irish-Americans, founded in 1861 for the purpose of aiding in the forcible separation of Ireland from England. Their most important organ, the *Irish People,* which was published in Ireland, was seized by the British government in 1865, and many leaders of the movement were arrested; but in the same year a convention at New York determined to establish an independent government in America. This led to an armed movement which resulted in several attacks on the Canadian frontier in 1866 and an incipient rebellion in Ireland in the following year. Later efforts to secure better conditions for Ireland are related in the article HOME RULE.

FEN′NEL, a fragrant plant of the parsley family, cultivated in gardens. It bears umbels of small, yellow flowers and has finely divided leaves, which give off a pleasant odor. The fruit, or in common language, the seed, is frequently employed in medicine, and the leaves are sometimes used to season sauces.

FER-DE-LANCE, *fair de lahns′*, a venomous snake of tropical America, one of the most terrible members of the rattlesnake family. It reaches a length of seven feet and is of a reddish-yellow brown, marked with a black stripe from eye to neck and dark cross bands on the body. The tail ends in a horny spine which the viper scrapes harshly against rough objects, but it does not rattle. Its bite is usually fatal.

FERDINAND I (1861–), from 1887 to 1918 the ruler of Bulgaria, whom the World War brought conspicuously to public view as an ally of the Germans, Austro-Hungarians and Turks (1915). Previous to that time he had been prominent as a leading spirit in the Balkan Wars (1912–1913).

Ferdinand was a son of the House of Saxe-Coburg, on his father's side, his mother was of the French house of Bourbon-Orleans. In 1886, while an officer in the Austrian army, he was offered the throne of Bulgaria, which in 1887 he accepted, with the title of prince. Recognition by the other powers did not follow until nine years later. Until 1908 he was officially known as Prince Ferdinand of Bulgaria; in that year he assumed the title of king, and in 1909 was so recognized by the powers.

In 1912 Ferdinand favored the Balkan League, and engaged successfully in the first of the Balkan Wars (which see). He was accordingly popular at home, but because of territorial quarrels with his allies of the first war a second struggle began almost immediately, from which Bulgaria emerged ingloriously, and the king lost prestige at home and throughout Europe.

During the first year of the World War (which see) Ferdinand was able to maintain neutrality, while trading with the contending sides for advantage. In October, 1915, he cast the lot of Bulgaria with the Germanic powers. In September, 1918, after varying fortunes in the struggle, Bulgaria capitulated to the entente nations and Ferdinand was forced to abdicate (October 3). His son Boris succeeded him. See BULGARIA, subhead *History*.

FERDINAND I (1503–1564), Holy Roman emperor, brother of Charles V of Germany, from whom he received, soon after Charles's accession as emperor, the hereditary possessions of the Hapsburgs in Austria. For many years he was chiefly occupied with a war with the Turks, who supported as king of Hungary John Zápolya of Transylvania. When Charles V abdicated the imperial throne in 1556, Ferdinand succeeded him. His rule was wise and enlightened, and he introduced a number of reforms.

FERDINAND II (1578–1637), Holy Roman emperor, grandson of Ferdinand I. He became duke of Styria, Carinthia and Carniola in 1590 and showed at once a determination to uproot Protestantism from his dominions. This well-known aversion to the Protestant faith was the cause of determined protest from the Protestants of Bohemia, when in 1617 Ferdinand was crowned king of that country (see AUSTRIA-HUNGARY). The result of this opposition to Ferdinand was the outbreak of the Thirty Years' War. In 1619, after the death of Matthias, Ferdinand was made emperor. He died before the Thirty Years' War was concluded.

FERDINAND II (1810–1859), king of the Two Sicilies, succeeded his father Francis I in 1830. The revolution in France in that year had unsettled the minds of men throughout the Continent, and Ferdinand was at first forced to make some concessions to his subjects, but soon recalled these, determining henceforward to make his will the only law. The result was a series of outbreaks, culminating in the year 1848, when Ferdinand earned the nickname of King Bomba, from his bombardment of Messina. Despotism was again established by force of arms, and when Ferdinand died his prisons were crowded with the best and bravest of his subjects.

FERDINAND IV of Naples, known, also, as Ferdinand I of the Two Sicilies (1751–1825), was the third son of Charles III, king of Spain, whom he succeeded in 1759 on the throne of Naples, on the accession of Charles to the throne of Spain. After the death of Louis XVI Ferdinand joined the coalition against France and took part in the general war from 1793 to 1796; but in 1799, after the defeat of the Neapolitans under General Mack, the French took possession of the whole kingdom and proclaimed a republic. The new republic did not last long, but six years later Ferdinand was again driven from Naples by the French. After the downfall of Napoleon he once more came to power and took the title of Ferdinand I, king of the Two Sicilies. In 1820, in consequence of a revolution, Ferdinand was obliged to swear to support a new and more liberal constitution. The Austrians, however, came to his help and reëstablished him in possession of absolute power.

FERDINAND V (1452–1516), king of Aragon, who received from the Pope the title of *the Catholic*, on account of the expulsion of the Moors from Spain, was the son of King John II. This was the Ferdinand who touches earliest American history through his marriage. In 1469 he married Isabella of Castile. This brought about that close connection between Aragon and Castile which became the basis of a united Spanish monarchy and raised Spain to preëminence among European states. After a bloody war of ten years Ferdinand and Isabella conquered Granada from the Moors (1491). The most brilliant event of their reign was the discovery of America, which made them sovereigns of a new world, through Isabella's faith in the designs of Christopher Columbus.

FERMENTA'TION, a general term for certain changes which result from the action of bacteria, by which organic substances are converted into new compounds. Fermentation takes place when food is digested, for the work of the gastric juice in softening the albumin in food is due to the activity of a ferment called pepsin. Other ferments, of a harmful nature, are at work when the food turns sour and brings on an attack of indigestion. The decaying of foods not properly protected and the action of yeast in bread dough are examples of fermentation familiar in the household. When milk turns sour it does so because the sugar in the milk is converted into lactic acid by fermentation.

From an industrial point of view the most important kind of fermentation is that in which there is a conversion of sugar into alcohol. The general course of alcoholic fermentation, as seen in brewing and in winemaking, is as follows: After a lapse of time, which may vary much according to temperature and other conditions, the liquid becomes cloudy and gas bubbles arise, increasing in frequency until the liquid begins to effervesce. The temperature of the liquid rises to a higher degree than that of the surrounding air, and on its surface appears a frothy matter known as *yeast*. After a time the climax is passed, the effervescence diminishes and the yeast settles down at the bottom of the liquor, which is now entirely deprived of its sugar and has the characteristic taste and effects of fermented liquors, (which see).

FERMENTED LIQUORS, alcoholic beverages, obtained by the fermentation and clarification of fluids containing sugar. Among the commonest kinds are *wine*, made from the juice of the grape; *ale*, or *beer*, made from an infusion of malt; *cider*, made from apples; *mead*, made from honey; *kumiss*, made by the Kirghiz from mares' milk, and *chica*, made from maize by the South American Indians. From all fermented liquors a spirit may be extracted by distillation. See Fermentation.

FERN ISLANDS. See Farne Islands.

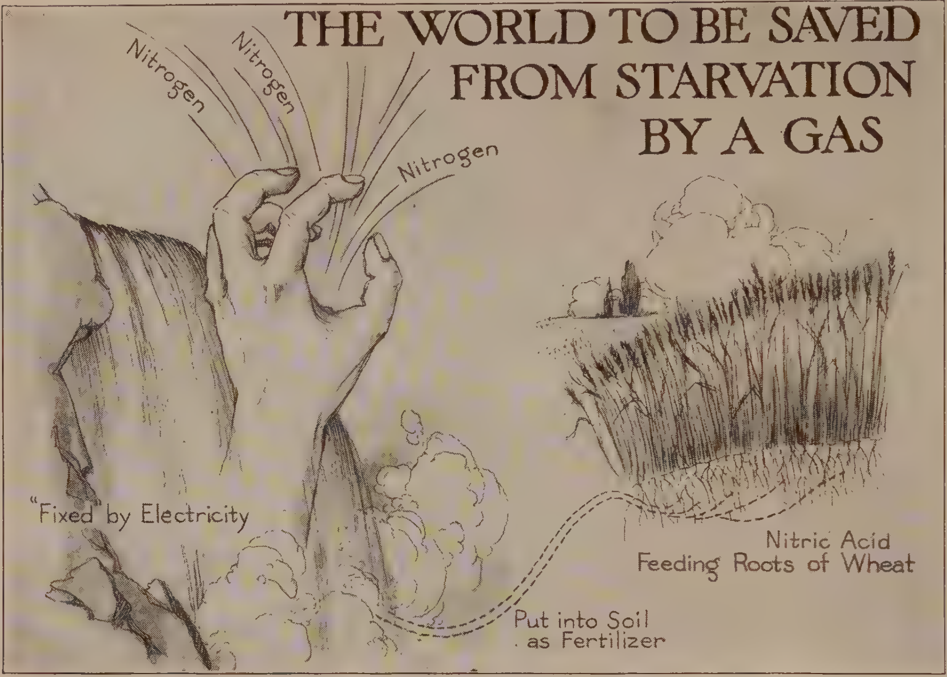
FERNS, the largest and most important family of the cryptogams, or flowerless plants. They put forth leaves, or, more properly, fronds, from a rootstock or from a hollow, treelike trunk. The fronds, as they appear from the ground, are rolled up at the tip, so that they have somewhat the appearance of a bishop's crozier. There are probably not less than 4,500 species of ferns, many of which live in the temperate regions, but the greatest number are found in the tropics, where heat and moisture encourage them to remarkable growth. In the tropical forests the tree ferns rival palms, rising sometimes to a height of fifty feet and bearing crests of fronds twenty feet in length.

CRESTED SHIELD

CHRISTMAS FERN

Most ferns grow in the earth, but some are aquatic, and many of the tropical species are

THE WORLD TO BE SAVED FROM STARVATION BY A GAS


Nitrogen
Nitrogen
Nitrogen
"Fixed" by Electricity
Nitric Acid Feeding Roots of Wheat
Put into Soil as Fertilizer

"There's no danger of a world famine!" you say. "And if there were, people can't live on GAS!" There IS danger of famine because the population is increasing faster than the food supply. "But can't the earth be made to yield more food?" That's just what the "gas" is to do! Nitrogen from the air, put into the soil as fertilizer, will increase the yield of wheat three or four times, and will make it profitable to put thousands of acres more into wheat growing.

Courtesy American Cyanamid Co.

The greatest and cheapest power (Niagara), the greatest heat, 4000° F. (electric furnace), and the greatest cold, 300° F. (liquid air), in combination, make it possible to "fix" the free nitrogen of the air for fertilizer. In these ovens hot calcium carbide and pure nitrogen react upon each other until a nitrate results.

air plants. Upon the fronds, in little dots or lines, or occasionally covering the whole leaf-surface, are ripened the minute, brown, dust-like spores. These, falling upon the ground, germinate and produce a minute hair-shaped body, not resembling at all the parent fern. Upon this body are produced the organs from which, in time, springs the commonly recognized fern in its original form thus affording a perfect illustration of what botanists call alternation of generations. At one time ferns were the principal vegetable growth of the earth; in decaying they formed some of the vast coal deposits of the Carboniferous Era (which see).

FERRARA, *fer rah′rah,* ITALY, capital of the province of the same name, is a city of great historic interest. It is situated in the northern part of the country, twenty-six miles north northeast of Bologna, in a fertile but unhealthful plain. The old ducal castle, or palace, now occupied by public offices; the cathedral; the Church of San Francesco; the houses where Ariosto and Guarini lived; the cell in which Tasso was imprisoned, and a monument to Savonarola, who was born here, are some of the interesting features of Ferrara. The city has, also, a public gallery of paintings, a university, founded in 1264, a theological seminary and a library. In the fifteenth century it was famous for its school of painting, one of the best in Italy. Ferrara was at the height of wealth and power in the Middle Ages. After the close of the sixteenth century it suffered a decline. Population, 1915, estimated, 102,550.

FERRERO, *fer ra′ro,* GUGLIELMO (1872–), an Italian historian, born near Naples, the son of a railway engineer. His political writings led to lecture engagements at Milan, the College de France, Canada and the United States. His best known books are *Between Two Worlds, Ancient Rome and Modern America,* and *Greatness and Decline of Rome,* the last of which is considered his best work, though pronounced by critics "more ambitious than scholarly," notwithstanding the author's wide knowledge of psychology and economics revealed in it.

FER′RET, a flesh-eating animal, closely allied to the polecat, about fourteen inches in length, of a pale yellow color, with red eyes. It is a native of Africa, but has been introduced into America and Europe. It cannot, however, live long in a cold climate. Ferrets are used for hunting rabbits and for killing rats and mice. They rarely devour the animals which they attack, but kill them and suck their blood. Their slender bodies enable them to enter burrows, but unless muzzled the ferrets are apt to leave their victims behind after sucking their blood.

FERRET

FERRIS WHEEL, an amusement device in the form of a double wheel, between whose circles carriages for passengers were swung. It was the largest "wheel" ever constructed, and was erected at the World's Columbian Exposition in 1893 at Chicago. Its name was taken from its inventor, G. W. G. Ferris, a Pittsburgh engineer.

Each wheel was 250 feet in diameter, connected by rods and struts. At the center of the wheel was an axle 45 feet in length and 32 inches in diameter. The spokes of the wheel were iron rods 2½ inches in diameter, arranged in pairs 13 feet apart at the crown connection. The wheel carried 36 cars, attached to the circumference, each having a seating capacity of 40 passengers. The total weight of the wheel was about 1,100 tons. The wheel was elevated 14 feet above the ground, making its total height 264 feet. The total cost of the wheel was about $300,000. At the close of the exposition it was taken down and removed to North Clark Street, Chicago, and was later taken to Saint Louis. It was finally demolished.

FERTILIZA′TION OF PLANTS. See CROSS FERTILIZATION; POLLEN.

FERTILIZERS, *fer′ti ly zerz,* substances used to enrich soils and make them produce larger crops. All plants require a certain amount of plant food, and when for any reason a soil becomes impoverished, fertilizers are supplied to it to make up the loss. An important reason for the wearing out of soil is the repeated growing of the same plant in the same field. Different plants require different kinds of food, and by alternating the crops from season to season, soil fertility can be conserved.

The substances required by plants are oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, potassium, calcium, iron and magnesium. Not all of these are supplied through the soil, since dioxide in the air is the source of carbon, and water is the source of hydrogen and oxygen.

Nitrogen, phosphorus, calcium and potassium are the substances which need to be supplied in greatest quantity. Nitrogen is found in abundance in manure, but a commercial fertilizer, nitrate of soda, which also contains it, is in great demand. Another commercial source is ammonium sulphate, a by-product from the manufacture of coke. Cowpeas, clover and certain other plants have the power of gathering free nitrogen from the air, and these plants are frequently used as soil renovators. Phosphate rock is the chief source of phosphorus for fertilizers, potash is the great storehouse of potassium, and calcium is supplied to the soil in the form of ground limestone, burned lime, hydrated lime, air-slaked lime or wood ashes.

Reliable information as to the best fertilizer to use in a given locality can usually be obtained by a farmer from the agricultural experiment station of his state. In most states the law requires the manufacturers of commercial fertilizers to take out a license for the sale of their products and requires a written guarantee for the amounts of essential substances which the fertilizers contain. The experiment stations analyze the fertilizers and determine the truth of the guarantees. In this way the farmer is protected against valueless fertilizers, which might do more harm than good.

Related Articles. Consult the following titles for additional information:

Agriculture
Guano
Manures
Nitrate
Nitrogen
Phosphorus
Potassium
Rotation of Crops

FES′TIVALS, or **FEASTS,** certain days or periods set apart for the celebration of some event. Among the Jews, six sacred feasts were prescribed by the Scriptures. The ancient Greeks celebrated the Dionysia, the Eleusiania, the four great national games, the Olympian, Isthmian, Nemean and Pythian (see article on each of the Greek games), and held many local festivals. The Roman festivals were the Saturnalia, Cerealia, Lupercalia and others. Almost all the festivals celebrated by the Roman Catholic Church are commemorative of events in the life of Christ, such as the Sabbath, Easter, Epiphany, Nativity, Christmas, Ascension, Pentecost, Annunciation and Purification. Most of these are kept by the Church of England, with a few additions. The ancient Persians were the only people who had no festivals. Presbyterians and most other Protestant bodies, except Lutherans, recognize no church festival but Sunday, Christmas and Easter. Certain saints' days, formerly printed in red ink in the Church of England calendar, became known as *red letter* days, hence the modern use of the term. The old term, "holy day," has been changed to "holiday," which now signifies a day of merrymaking or of rest.

FETISH, or **FETICH,** *fe′tish,* a word derived from the Portuguese *feitiço,* meaning *magic.* The Portuguese gave this name to the idols of the negroes of the Senegal, and afterward the word received a more extensive meaning. A fetish is any object which is regarded with a feeling of awe; it is believed to be possessed of mysterious powers. It may be animate, as a fowl, a serpent; or inanimate, as a river, a tooth, a shell. Fetish worship yet prevails in Guinea and other parts of the west coast of Africa. In addition to the common fetish of the tribe, every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes his fetish or throws it away or breaks it in pieces, and chooses a new one.

FEUDAL, *fu′dal,* **SYSTEM,** a system of land tenure which developed in Europe during the Middle Ages. It had its origin in the fifth century among the Franks of Gaul, whose kings, in order to keep order in the country, divided the land among their most powerful warriors. These exercised kingly power in their own domain, and pledged themselves to give military aid to the king when he needed their help. After the breaking up of Charlemagne's empire (see CHARLEMAGNE), feudalism developed rapidly, for it was the only system whereby the people could be protected from the lawlessness

FEUDALISM AND CHIVALRY

COSTUMES OF THE PERIOD

FEUDALISM

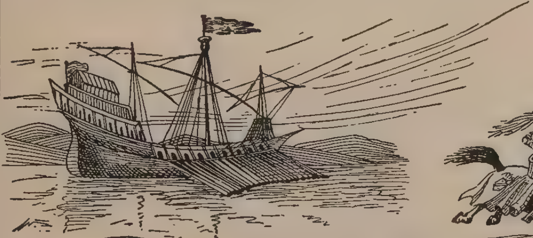
- Origin
- Social Organizations
- Act of Homage
- Ceremony of Investiture
- Feudal Obligations
- Hereditary Rights
- Feudal Homes and Families
- Place of Church in Society
- Military System
- Decline
- Defects and Merits

TOWER OF A GERMAN FEUDAL CASTLE

CHIVALRY

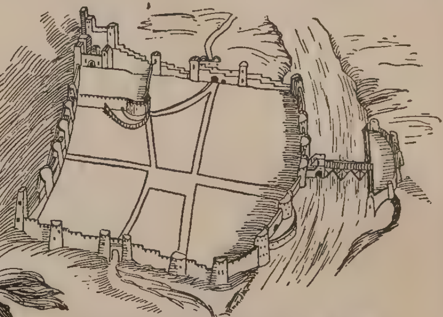
- Knighthood
- Knightly Virtues
- Membership
- Education
- Ceremonies
- Tournaments
- Jousting
- Awards
- Decline
- Influences

CONFERRING KNIGHTHOOD ON THE FIELD OF BATTLE



WATER TRANSPORTATION IN THE FEUDAL AGE

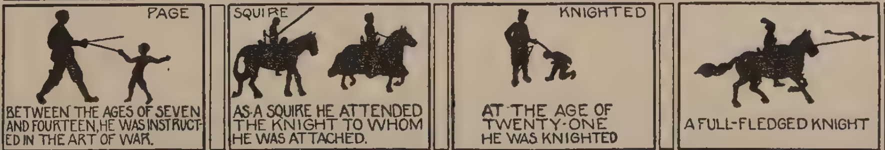
A TILTING MATCH BETWEEN TWO KNIGHTS



MEDIEVAL FORTIFICATIONS
Castle Protected by a River, Hills, Outer and Inner Walls.

THE CEREMONY OF HOMAGE
(From a Seal of the Twelfth Century)

DEVELOPMENT OF A KNIGHT



PAGE

BETWEEN THE AGES OF SEVEN AND FOURTEEN, HE WAS INSTRUCTED IN THE ART OF WAR.

SQUIRE

AS A SQUIRE HE ATTENDED THE KNIGHT TO WHOM HE WAS ATTACHED.

KNIGHTED

AT THE AGE OF TWENTY-ONE HE WAS KNIGHTED

A FULL-FLEDGED KNIGHT

SERF

of the age. The powerful lords who were under the king divided their lands among lesser lords, and these in turn divided theirs, until there was a complete division of the people into classes, with the king at the head and the serfs at the foot. These latter were the farm laborers who were bound to the soil and considered a part of the estate.

Any piece of land granted to a *vassal,* or *retainer,* was called a *fief,* or *feud.* The one who granted it was called a *lord,* or *liege.* The lord promised his retainer protection and advice, and in return received promises of military service and other aid. On the Continent the feudal system tended to weaken the king's authority, because the feudal lords gained almost complete independence, but in England the reverse was true. William the Conqueror compelled all vassals to swear allegiance to him personally, and the nobles were correspondingly limited in power.

Feudalism died with the passing of the medieval period. Several circumstances caused its decline. Among these were the Crusades, the development of the cities, the change in modes of warfare and the opposition of the common people and kings. The Crusades weakened it because during these wars large numbers of the feudal lords were killed, and many others lost their holdings. With the development of the cities a new industrial class arose, and the workers became so strong that they were able to throw off the rule of the lord to whose fief they belonged. With the introduction of firearms the reign of the armor-clad knight passed into history, and this destroyed the military superiority of the upper classes. The common people as a whole opposed feudalism as they advanced in democracy, and the kings were also hostile to any system that undermined their authority. All of these forces, working together, gave feudalism its death blow, though it was slow in disappearing. See CHIVALRY.

FE'VER, a condition accompanying many diseases and characterized by a rise in temperature, a feeling of weakness, loss of appetite, headache and, frequently, pains in the body and limbs. During the fever the pulse and respiration become more rapid and the skin is dry. A period of decline usually follows the period of rise in temperature; during the lowering of temperature the patient perspires, the pain ceases and sleep usually follows.

Fever is usually caused by the development within the system of poisonous germs which have been taken in from without. What is called *intermittent fever* is one in which the temperature alternately rises and falls. In a low fever the temperature rises but little above the normal, being from 100° to 102°; but when the temperature rises above 103° and as high as 105°, the fever is considered high. Above 105° is considered very dangerous. Fever causes waste of tissue, and upon recovery the patient is left in an emaciated condition and requires some time for recuperation. See the article DISEASE, for a list of the fevers discussed in these volumes.

FE'VERFEW, a plant common in waste places and near hedges. It has a tapering root, an erect, branching stem about two feet high, and stalked compound leaves, of a grayish-green color. The flowers, which resemble an ox-eye daisy, are white or cream, with yellow centers. The plant was once supposed to be a cure for fever, hence the name.

FEZ, a tall brimless hat made of fine red cloth and ornamented with a tassel. It was first made at Fez (Morocco), and that city long had the monopoly of manufacture, for the beautiful rich crimson used for dyeing it could be obtained only from a local berry. To-day the dye is chemically produced, and the fez is made in France and in Turkey. It is worn throughout Northern Africa, where it is called a *tarbush,* and in Turkey.

FEZ, MOROCCO, the chief city of the French protectorate, and one of its four capitals (the others being Mequinez, Marakesh and Rabat). It is situated about 100 miles south of the Strait of Gibraltar and nearly the same distance east of the Atlantic Ocean. The city is unattractive, for nearly all of it is filthy and unsanitary, and it has a poor water supply. The small section in which Europeans congregate is fairly modern and clean. There were once 800 mosques in Fez, but with the decline of the city from 400,000 people to 105,800 in 1911, nearly 700 of them have disappeared. The industries are largely devoted to the making of rugs, shawls, and the headdress called the fez (see above), and Fez is the most important commercial center of the country. The city was founded about 793.

FEZZAN, *fez zahn',* a political division of Tripoli, belonging to Italy since 1912. The capital is Murzuk (about 5,000 people), and this town is the center of a considerable caravan trade. See TRIPOLI.

FIAT MONEY, any kind of paper currency which is not worth intrinsically the amount stamped upon it as its value. In other words, it is given its value by the *fiat,* or order, of the government which issues it. Silver certificates, gold certificates, Federal Bank notes and the like are not fiat money; each bill of such class has behind it for redemption purposes actual value in silver, gold or other valuable material to the amount for which it passes current. The small silver coins are fiat money (see MONEY). The term was first used in connection with the greenbacks (which see) of the Civil War period.

FI'BER, the threadlike portion of animal, vegetable or mineral substances. There are many varieties of fibers, and they are used for a large number of purposes, but when the term *fiber* is used without any qualification, it means *textile fiber.* The most important textile fibers are cotton, wool, silk, flax, hemp, jute and ramie, or China grass. Each of these is described under its appropriate title.

Wool and silk constitute the only valuable animal fibers, but under the term *wool* is included that obtained from the sheep, the alpaca, the Angora and other species of goat. Paper fibers include those that can be used in the manufacture of paper, but are not suitable for other purposes. The most important of this class are wood fiber and that obtained from Esparto grass and corn husks. Brush fibers include a number of fibers obtained from tropical plants, usually species of palm, and are used in the manufacture of brushes. Palmetto, tampico and cocoa fibers are the most common fibers for this purpose. Broomcorn is classed as a brush fiber by manufacturers. The finest textile fibers are usually grown in the temperate climate. With this exception, nearly all those of commercial importance are obtained from tropical or semitropical countries.

Asbestos, a valuable mineral fiber, is described under that title in these volumes.

FI'BRIN, tough, jellylike substance, the solid matter which is deposited when blood coagulates. In circulating blood it is not solid, but when it is exposed to the air it causes the clot that is seen in wounds. If the wounded blood vessel is small the clot stops the flow of blood. Fibrin can be obtained by switching newly-drawn blood with a bundle of twigs, when the fibrin clings to them in threads. The coloring matter may be washed out with water. Vegetable fibrin is substance found in grains. It somewhat resembles animal fibrin.

FICHTE, *fiK'te,* JOHANN GOTTLIEB (1762–1814), a German philosopher, born at Rammenau. He was the son of a ribbon-weaver and spent his early years in poverty, but was fortunate enough to attract the attention of a nobleman, who provided for his early education. Upon his patron's death Fichte was obliged to support himself at the university as a tutor. He studied theology and philosophy in the universities of Jena and Leipzig, and in 1791 went to Königsberg, where he met Kant and was persuaded by him to publish his *Critique of All Revelation.* This led to his appointment to a professorship in philosophy at Jena. He published several other works in the course of five years, and because the theories he expressed did not coincide with accepted religious beliefs he was forced to resign. Subsequently he was five years professor of philosophy in the University of Berlin. He died from typhus fever, contracted while taking care of soldiers who were wounded in the war of 1813.

Fichte's philosophy is founded on the idea that each of us creates his world for himself. In accordance with this idea each individual, in order to exist and have activity, must recognize something other than itself—the *notself.* Experience consists in building up varied forms of the *notself;* that is, in constructing an external world. For the sake of common convenience and because of the need of social life, it is the duty of all individuals to make their worlds as nearly alike as possible; hence, we find ourselves accepting as true the same phenomena and objects of sense. The true self, Fichte declared, cannot be the finite personality, but is the great universal self—God—whose will is everywhere expressed through the wills of finite creatures.

FICTION, *fik'shun,* a word which comes from a Latin verb meaning *to invent.* It is not difficult to see why we apply it to a class of literature which includes such writings as novels, short stories and tales of adventure. In these literary forms the author narrates events and presents characters that are created by his imagination, that is, which he has invented. While plays like Shakespeare's *As You Like It* and poems like Longfellow's *Hiawatha* are also fiction, in the sense of being "made up," we do not classify them as fiction. That term has come to mean prose stories, such as Stevenson's *Kidnapped,* Bret Harte's *Luck of Roaring Camp* and Miss Alcott's *Little Women.*

Generally speaking, books of fiction have been published in greater numbers than any other class throughout the history of book publishing in America. Since 1910, however, there has been a gradual lessening of the number of novels and other volumes of fiction published, as well as a decreasing proportion of fiction to the whole total. The World War was responsible for an increase of public interest in history, civil government, geography and other vital subjects and this tended to reduce the number of stories considerably. In 1918 there were 922 works on history published in the United States, as compared with 788 on fiction. At the same time, fiction magazines were never more popular, and there is no likelihood that the public will ever cease to demand stories in great numbers.

Does Fiction Pay? The familiar picture of the struggling author starving in an attic is far from being a true picture of the successful writer of present-day fiction. Authors whose books go through several editions and are listed as "best sellers" may receive as high as a dollar a word for an original manuscript, and the sums received through royalties are occasionally fortunes in themselves. It is not unusual for a popular magazine to pay $1,000 for a short story, and writers of wide reputation, like Conan Doyle, Rudyard Kipling, H. S. Wells, Mary Roberts Rinehart, Winston Churchill or Margaret Deland may receive several times that amount. Beginners, however, must be content with very moderate compensation until they have won a favorable place for themselves.

The Elements of a Work of Fiction. Whether a story has the scope of a long novel or is a magazine narrative of a few pages, it must have certain distinct elements. The one which comes first to mind is the make-up of the story, or, in other words, the plot. In some stories the events lead to a definite climax, and the characters are subordinated to the development of the plot; in others the plot seems to be merely a device to bring out the development of character. A story which well illustrates a blending of the two methods, with plot and character development evenly balanced, is Hawthorne's *Scarlet Letter.*

In many of Arnold Bennett's novels, such as *The Old Wives' Tale* and *Clayhanger,* there is no outstanding plot, but there is a series of episodes covering a long period of time. Our interest, in each case, is centered in the characters, their development and growth, and we find that the events of their lives are of secondary importance. In long novels, such as these, there is usually more than one story developed. In Thackeray's *Vanity Fair* and in Dickens' *Nicholas Nickleby,* for example, there are several sets of characters introduced, and their stories are brought into the main trend of the book. The long, discursive novel is a form not adapted to the development of a single, clear-cut plot.

The human element in a story is one of its strongest points of interest, and the portrayal of character has come to have a very prominent place in fiction. There are books, such as George Eliot's *Adam Bede,* Jane Austen's *Emma,* Thackeray's *The Newcomes* or Hugo's *Les Miserables,* in which the characters seem so real that they become live personalities to the reader. On the other hand, any book whose characters are stilted and unnatural seems a disappointing thing. There is, perhaps, no more interesting line of study for the student of fiction than that which takes up the study of character.

Besides plot and characters, every story has some sort of a background. In a long novel there are often many different scenes, as in most of the novels of Thackeray and Dickens. In George Eliot's *Adam Bede,* however, the background is almost wholly that of English rural life, while many modern American stories are laid entirely in the large cities. Examples of the latter are Rupert Hughes' *Thirteenth Commandment* and Frank Norris' *The Pit.* In presenting the scenes of a story the author must use a certain amount of description, and his ability to picture vividly the background of his narrative is a test of his art in this direction.

The reader sometimes finishes a book with the sense of having experienced a moral uplift, or with a new vision of some phase of life. In the time of Dickens, people who read his *Nicholas Nickleby* were aroused to the abuses of boys' schools, just as the author intended. That novel is a good example of the purpose type. In our own times people read Upton Sinclair's *The Jungle* with much the same feeling. Yet there are many novels of high moral tone in which the lesson is not openly presented. It is there, but it is hidden in the heart of the story. A work of fiction that is truly a work of art cannot deliberately point a moral, the critics declare. Rather, it is expressed through the lives of the characters and the working out of their experiences. The reader, if he reflects at all, draws the lesson for himself.

A List of Standard Novels. The following list does not pretend to be conclusive. It gives a number of standard works of fiction, representative of the best, and all well worth reading:

The Heart of Midlothian	Scott
A Tale of Two Cities	Dickens
Great Expectations	Dickens
Henry Esmond	Thackeray
Vanity Fair	Thackeray
Les Miserables	Hugo
Eugenie Grandet	Balzac
Pride and Prejudice	Austen
Jane Eyre	Bronte
Silas Marner	Eliot
Joseph Vance	De Morgan
The Scarlet Letter	Hawthorne
The Rise of Silas Lapham	Howells
The Awakening of Helena Richie	Deland

A list of the important writers of fiction accompanies the article Novel.

FIDDLER CRAB, a small crab, so-called because one claw of the male is large and shaped somewhat like a violin. These crabs congregate in large numbers in salt marshes and make burrows in the mud just above high tide. They are vegetarians, and wander about in search of sea plants for food. When alarmed, they scurry sidewise into the first opening they can reach.

FIEF, *feef*. See FEUDAL SYSTEM.

FIELD, CYRUS WEST (1819–1892), an American merchant, the man whose faith brought the eastern and western hemispheres into instant communication by means of the ocean cable.

He was born at Stockbridge, Mass., and started in mercantile business in New York City. After a disastrous failure he acquired a large fortune, and, having obtained a charter giving him exclusive right for fifty years to land ocean telegraphs on the coast of Newfoundland, he organized an Atlantic telegraph company. Attempts to lay cables were made in 1857 and 1858, but without permanent success, and the Civil War having broken out, it was not until July 27, 1866, that a cable was successfully laid, the largest vessel then afloat, the *Great Eastern*, being used. Mr. Field took an active part in establishing telegraphic communication with the West Indies and South America and was connected with various important railroad enterprises. He was a brother of Stephen J. Field (which see). See CABLE, SUBMARINE.

CYRUS W. FIELD

FIELD, EUGENE (1850–1895), an American author and humorist, known especially as the poet of childhood. He was born in Saint Louis, Mo. Having lost his mother when he was but seven years of age, he was brought up by a cousin, Miss Mary Field French, of Amherst, Mass. He studied at Williams College, was transferred to Knox College, Galesburg, Ill., where he remained a year; he then completed his education at the Missouri State University, at Columbia.

EUGENE FIELD

On his return to America after a trip through Europe, Field found it necessary to turn his attention to earning a livelihood, and his taste for journalism led him into that profession. From contributor to the Saint Louis *Journal*, he rose to the position of city editor, and he was afterward connected with various papers in Saint Joseph, Kansas City, Denver and Chicago. A series of humorous articles published in a Denver paper brought him favorable notice, and in 1883 he was given charge of a department called "Sharps and Flats," in the Chicago *Morning News* (afterward the *Record* and *The Record-Herald*). In this capacity he made a wide reputation as a humorist.

He also came into notice as a lecturer. His propensity for practical joking was well known; sometimes he would amuse himself by writing verses, signing a friend's name and after publication criticising them unmercifully.

Field was a true lover of children, but his poems, while most of them appeal forcibly to children, are also child poems for older people. *Little Boy Blue* and *Sometime there ben a lyttle boy* show his gift for mingling humor and pathos; and *Seein' Things, Jes' Fore Christmas* and *The Limitations of Youth* reveal his sympathy with the heart of a boy. Among his works may be mentioned *The Model Primer, A Little Book of Profitable Tales, A Little Book of Western Verse, Echoes of a Sabine Farm, With Trumpet and Drum* and *The Love Affairs of a Bibliomaniac.*

Teachers who wish to give a Eugene Field program will find helpful suggestions in the *Eugene Field Book.*

FIELD, MARSHALL (1835–1906), an American merchant, with the possible exception of John Wanamaker the greatest merchant who ever lived. He was born at Conway, Mass., and spent his boyhood on a farm, but at the age of seventeen became a clerk in a dry goods store at Pittsfield, Mass. He removed to Chicago in 1856, becoming a partner in a dry goods house, which in 1865 included the three now famous merchants. Marshall Field, Potter Palmer and L. Z. Leiter. Palmer retired in 1867 and Leiter in 1881, Field becoming head of the firm, which was thereafter known as Marshall Field & Company. In the next twenty-five years it became the largest wholesale and retail dry goods house in the world. Field was a liberal patron of the University of Chicago and founded the Field Columbian Museum as a permanent repository for interesting exhibits at the World's Columbian Exposition of 1893. By his will he gave the institution $9,000,000. He was director of many corporations. The bulk of his vast fortune, estimated at from $120,000,000 to $150,000,000, was by his will placed in trust for his two grandchildren, aged then eight and twelve, respectively, who will not come into full possession of the property until they are fifty years of age. See FIELD COLUMBIAN MUSEUM.

FIELD, STEPHEN JOHNSON (1816–1899), an American jurist, born in Haddam, Conn., a brother of Cyrus W. Field. He graduated at Williams College in 1837 and studied law in New York City. In 1849 he went to California with the gold seekers and exerted notable influence during the period of disorder before the admission of California as a state. After the admission of California he served ably in the legislature. In 1857 he became judge of the supreme court of California and two years later became chief justice. President Lincoln appointed him Associate Justice of the Supreme Court in 1863 and for thirty-four years he served with marked ability. Many of his opinions are important contributions to American constitutional law. He was a member of the Electoral Commission of 1876, and voted with the minority in favor of Samuel J. Tilden (see ELECTORAL COMMISSION).

FIELD COLUMBIAN MUSEUM, a great museum of natural history, the gift to Chicago of Marshall Field (which see). By purchase and donations great numbers of exhibits of the World's Columbian Exposition were secured as a nucleus of the new museum. Scientific expeditions have been sent to all parts of the world for new material, and always in some far land men are working to secure valuable exhibits.

In 1919 a new home for the museum was completed on a downtown site on the shore of Lake Michigan, and for this Field gave $4,000,000. Previous to that year it had been housed in Jackson Park. Field's first gift was $1,000,000 for preliminary purchases, and in his will he gave $4,000,000 more for an endowment fund, thus bringing his gift to $9,000,000.

FIELD GLASS, a magnifying instrument for viewing objects at a distance. The type of field glass commonly used consists of two short telescopes from five to ten inches long, set parallel. The magnifying power of the field glass depends upon the number of times the focal length of the objective may be divided by that of the eyepiece; hence, the length of the tube is a factor of construction. To increase the focal length of the objective, each tube is fitted with two prisms which reflect the rays.

FIELD'ING, HENRY (1707–1754), one of the greatest of English novelists, born at Sharpham Park, in Somersetshire. He studied at Eton and at Leyden, and then went to London and began writing for the stage. He wrote several comedies and farces which failed to win popularity. In 1737 he married a Miss Craddock, a lady of some fortune. At the same time, by the death of his mother, he came into possession of a small estate. His wife's fortune he soon dissipated, and he was again obliged to depend on his pen for his living.

In 1742 appeared the first of his great novels, *Joseph Andrews,* which he had at first conceived as a burlesque of Richardson's *Pamela.* It met with instant success, and was followed by *Jonathan Wild,* a satirical work, which had little interest beyond its own day. In 1749 Fielding's masterpiece, *Tom Jones,* appeared, and this was followed two years afterward by *Amelia.* Fielding had a varied experience, and he reproduced life as he saw it. His scenes are often sordid, but are relieved by wit and humor and a sympathy for human frailties such as few authors have possessed.

FIELD MARSHAL, in Great Britain, Germany and Austria the highest title bestowed on an officer in the army. In France there is one of still greater dignity—that of marshal of France—which is borne by Ferdinand Foch, Joseph Jacques Joffre and Henri Pétain. The last great field marshal of Germany was Von Hindenburg; Britain had two in the World War—French and Haig—after the death of Lord Kitchener.

FIELD OF THE CLOTH OF GOLD, the name given to a plain in France, in the present Department of Pas-de-Calais, celebrated for the meeting (June 7 to June 20, 1520) between Henry VIII, of England, and Francis I, of France. The diplomatic results of the meeting were little or nothing, and the event is now memorable only as a grand historic parade. The splendor of the festivities and the gorgeousness of the trappings of the attendant nobles gave to the place its name.

FI'ERY CROSS, among the Scottish Highlanders, a cross of light wood, the extremities of which were set afire and then extinguished in the blood of a goat. This cross formerly was sent from place to place as a summons to arms and was also known as the *Crantara.*

FIFE, a small wind instrument, resembling the flute and piccolo, but having no keys. Its tube is closed at one end and is pierced with six finger holes. The player blows into a hole near the closed end of the tube, and the music produced is extremely clear and shrill. The fife is commonly used with the drum in military parades. Its ordinary compass is two octaves, from D on the fourth line of the treble staff upward.

FIFTEEN DECISIVE BATTLES. The English historian Sir Edward Creasy (which see), in *The Fifteen Decisive Battles of the World,* describes the following as the battles which have been instrumental in changing the course of history. His book was written in 1851. Since that time other battles which historians will rank as decisive have been fought. Among these will doubtless be listed Gettysburg (1863), Mukden (1905), the Marne (1914), and again the Marne in 1918, and the Argonne battles before the armistice in 1919. The fifteen that Creasy deemed decisive are as follows:

(1) **Marathon** (490 B. C.). In this, the Greeks under Miltiades defeated Cyrus, the Persian king, and thus rendered impossible the conquest of Europe by Asiatic peoples. See Marathon.

(2) **Syracuse** (413 B. C.). In this the Athenians were overthrown and the extension of Greek rule was checked. See Syracuse.

(3) **Arbela** (331 B. C.). Alexander the Great by his victory over Darius made possible the introduction of European civilization into Asia. See Arbela.

(4) **Metaurus** (204 B. C.). This battle was the defeat of Hannibal by the Romans and brought about the destruction of Carthage.

(5) **Arminius** (A. D. 9) defeated the Roman general Varus, destroyed his legions and thus overthrew Roman dominion in Germany. See Arminius.

(6) **Chalons** (451). Here the defeat of Attila by the Visigothic king Theodoric saved Europe from devastation at the hands of the Huns. See Chalons-sur-Marne.

(7) **Tours** (732). In this battle Charles Martel defeated the Saracens and checked the spread of Mohammedanism in Europe. See Tours.

(8) **Hastings** (1066). In this battle William the Conqueror defeated Harold and won for himself the English throne and for the Normans the control of England. See Hastings, Battle of.

(9) **Orleans** (1429). In this battle Joan of Arc, by her defeat of the British and the relief of the town, made possible the liberation of France from British dominion. See Orleans.

(10) **Armada, The** (1588). The defeat of the Spanish Armada was fatal to Spanish hopes in England. See Armada.

(11) **Blenheim** (1704). Here the duke of Marlborough by his defeat of the French army checked the ambitious schemes of Louis XIV of France. See Blenheim.

(12) **Pultowa** (1709). Here Peter the Great defeated Charles XII of Sweden and firmly established the Russian empire. See Charles XII.

(13) **Saratoga** (1777). The defeat of the English under General Burgoyne by the American troops under General Gates turned the tide of the Revolution in favor of the colonists. See Saratoga, Battle of.

(14) **Valmy** (1792). The French won the victory against the armies of the allies under the duke of Brunswick, and the continuation of the French Revolution was made possible. See Valmy.

(15) **Waterloo** (1815). Napoleon I was finally overthrown by the allied armies under the Duke of Wellington. See Waterloo, Battle of.

FIG, the delicious and widely-used fruit of a tree belonging to the mulberry family. The fig plant was found originally in Asia Minor, but is now cultivated in various warm regions of the world. The countries bordering on the Mediterranean are important centers of the fig industry, but the fruit gives promise some day to be a profitable crop in the Southern and Western United States. California is the chief state in its production; Mississippi was second at the time of the 1910 census, but increasing attention is being given to fig culture in Arizona, Texas, Louisiana and Alabama. The annual crop in the United States is now over 35,000 pounds.

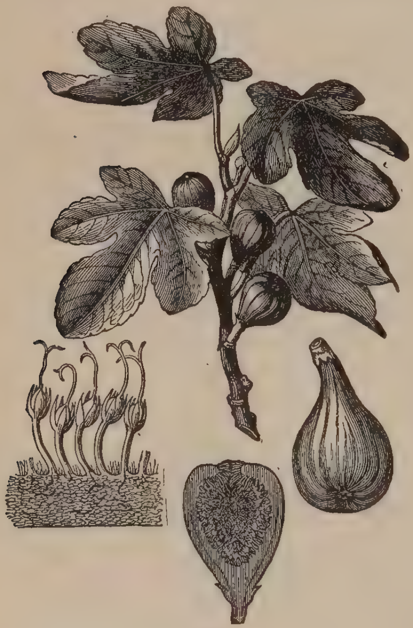


FIG
Female Flowers and Fruit.

The tree grows from fifteen to thirty feet in height. The so-called fruit is really the pulpy end of a stem, which has grown around and nearly enclosed the edible golden seeds. All the flowers are borne on the inner wall of this fleshy receptacle. Figs are eaten fresh, dried, canned and preserved, but they are most popular as a dried fruit, and in this form they are not surpassed in flavor or nutriment by any other dried fruit. Dried figs are more than one-half sugar, and over eighteen per cent protein. They have a higher fuel value than sirloin steak, and are slightly laxative.

Of the several varieties, the Smyrna fig is the most desirable. It is evident that the fig fruit, being a container of the flowers, cannot be fertilized by the ordinary methods of cross fertilization, as the pollen cannot be borne about by wind or insects. Accordingly a special method of fertilization, called *caprification,* is employed. Branches of the wild fig, known as the *Capri fig,* are tied in the tops of cultivated trees. This variety is the only one that bears staminate flowers, and to effect the transference of pollen, the services of a parasitic insect called the fig wasp are used. This wasp hatches within the receptacle of the wild fig. The female wasp, in crawling about to find a place to deposit her eggs, carries pollen from the staminate flowers of the wild fig to the pistillate flowers of the cultivated variety, and as a result the large, sweet Smyrna figs are produced. Until the Capri fig and the fig wasp were introduced into California the Smyrna fig could not be grown in that state.

FIGARO, *fe ga ro′,* a type of character distinguished by shrewdness and adroitness in intrigue, first introduced on the French stage in 1785 by Beaumarchais. His is the title rôle in *The Barber of Seville;* in the *Marriage of Figaro* he is a cunning valet who hoodwinks everybody. The character was so well received that the name became synonymous with clever daring, roguery and intrigue. One of the principal journals of Paris, founded in 1826, is called *Le Figaro.*

FIGURES OF SPEECH, are phrases used with some other than their literal meaning. By figurative language we mean language in which such expressions have a prominent place. That writer was using figurative language who described Rome as a city—

"That sate on her seven hills, and from her throne
Of beauty ruled the world."

In this case Rome is thought of as a queen on her throne. It is not alone in poetry that figures are used. They are heard often in everyday speech, serving in many instances to give force and character to what is said. The boy who speaks of "cramming" for his Latin examination, and the girl who says she is studying Browning to "cultivate" her mind are using figures of speech.

It is customary to classify figurative expressions into figures of rhetoric, figures of etymology and figures of syntax. Those of the first class differ from the others in being figures of thought rather than of grammatical form. Simile and metaphor are the most common rhetorical figures. A simile is a comparison in which use is made of either one of the comparative words *like* and *as*. For example: "Charity, *like the sun*, brightens everything on which it shines." "Pleasant words are *as an honey comb*." A metaphor is an implied comparison. The two lines of poetry in the first paragraph of this article contain a metaphor, as Rome is likened unto a queen, though this is merely implied by the phrasing. Expressions such as *raging sea, howling wind* and *smiling skies* are metaphors, for in each case there is an implied comparison.

The *figures of etymology* have reference to the forms of words and consist largely in the use of such forms as *o'er* for *over* and *'twixt* for *betwixt*, while *figures of syntax* are variations in the construction of sentences. The most common figure of syntax is the ellipsis, by which is meant the omission of some word, phrase or clause which is essential to the grammatical completeness of a sentence, but which is omitted with the intention of making an expression more forcible. This figure is common in ordinary speech, and every such expression as *Here!* for *Come here! Less noise!* for *Let there be less noise!* is an example of ellipsis.

Related Articles. Consult the following titles for additional information:

Metonymy Metaphor Simile

FIJI, *fe'je*, **ISLANDS**, a group of over 200 small islands in the South Pacific Ocean, discovered by Tasman in 1643 and ceded by the Fiji chiefs to Great Britain in 1874. Only eighty of the islands are inhabited. The total area is about 8,000 square miles. Only two of the islands are of large size, Viti Levu, or Naviti Levu, and Vanua Levu, or Vuya. The entire group is mostly of volcanic origin, and the surface is mountainous. The soil is extremely fertile and produces cocoanut palms, breadfruit, bananas, pandanus, oranges, taros, yams, sweet potatoes, maize, tobacco and sugar cane. Timber trees, including the chestnut, are plentiful; sandal wood is now scarce. The chief occupation is agriculture.

The islands constitute a British Crown colony, under a governor, assisted by an executive council and legislative assembly. Native chiefs take part in the administration. Since the annexation the prosperity of the colony has been remarkable. The chief article of export is sugar; the next is copra, the dried kernels of the cocoanut. The other important exports are cotton, molasses and coffee. The capital is Suva, on the south coast of Viti Levu; the European population of the town was 1,741 in 1921.

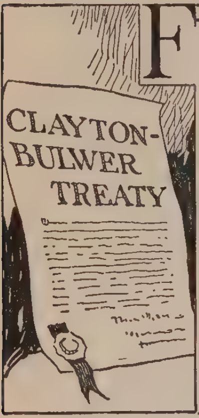
The island of Rotumah, to the north, was annexed to Fiji in 1881. The inhabitants are of middle stature, strongly built, with a complexion between copper color and black, and for many years have been Christians. Population, 1921 (estimated) 162,604.

FILE, a hand tool, the essential part of which is a rod or bar of steel with rough surface, used for cutting down and shaping metal and other hard surfaces. There are three distinct "cuts" of file, from which an almost endless variety of forms have been developed. These are the *single-cut, double-cut* and *rasp*. All have varying degrees of coarseness, designated by the terms smooth, second-cut, bastard and coarse. The single-cut file surface is traversed by diagonal parallel furrows; the double-cut surface by diagonal furrows crossing at right angles. The rasp is a toothed file. Instead of furrows angular pits made with a pointed punch, cover its surface. The several kinds of files are grouped according to the shapes of their cross-sections into square, triangular, round, and so on. The pointed end of the file which fits into the handle is called the tang. Most files are pointed at the end opposite the handle, though not always; blunt files, which do not taper, are used in the trades.

FILE FISH, a name given to certain fishes, from the fact that the dorsal spine is roughened like a file. One species, a common inhabitant of the Mediterranean, which grows to the length of two feet, has the power of inflating its sides at pleasure. The best-known filefish is the barnacle eater, found north of England. It is of a tawny color and is often seen in aquariums. These fishes are related to the trigger fishes.

FIL'IBUSTERS, private citizens of one country who interfere in the affairs of another with which their country is at peace. The name has been chiefly used to refer to those citizens of the United States who endeavored to establish settlements in the Spanish islands and colonies in Central

America, and later to control the policies of those colonies, and also to those who had illicit relations with the insurgents during the rebellions of the Spanish colonies. Among the most noted of the filibusters was William Walker, who made three expeditions to Nicaragua (1855, 1857 and 1860). See Walker, William.



FILLMORE, Millard (1800–1874), thirteenth President of the United States, and Vice-President in Taylor's administration until the latter's death. Fillmore was the second President to attain the office of chief executive through the death of the head of the government, the first having been John Tyler. His name is not connected with such stirring events in American history as the name of Lincoln, McKinley or Wilson, and his personality made no such impression as that of Jackson, Cleveland, or Roosevelt, but an impartial study of his administration compels respect for the sincerity and honesty of the man.

Fillmore was born on February 7, 1800, at Summer Hill, New York. His father was too poor to give him even an ordinary school education, and at the age of fifteen Millard became an apprentice in the wool-carding trade. During his apprenticeship he spent every spare moment in reading and study. A lawyer named Wood became interested in him, and when the youth was nineteen took him into his office to study law, placing at his disposal funds for the prosecution of his studies. Fillmore devoted part of his time teaching school. In 1821 he removed to Buffalo, where, in spite of his inadequate training, he was admitted to the bar in 1823. In 1828 he was chosen as an Anti-Mason representative in the state legislature, and there he procured the passage of a bill abolishing imprisonment for debt in New York.

A firm believer in Whig principles, he became a Whig member of Congress in 1832, and was reëlected several times. In Congress he became known as one of the opponents of Jackson and Van Buren, and as an advocate of a protective tariff; and when, in 1842, he was chairman of the Ways and Means Committee, he helped to frame the tariff law of that year. Fillmore retired from Congress in 1843, was defeated for the governorship of New York in 1844, and elected comptroller of the state in 1847. The following year he headed the successful Whig ticket with Taylor.

MILLARD FILLMORE

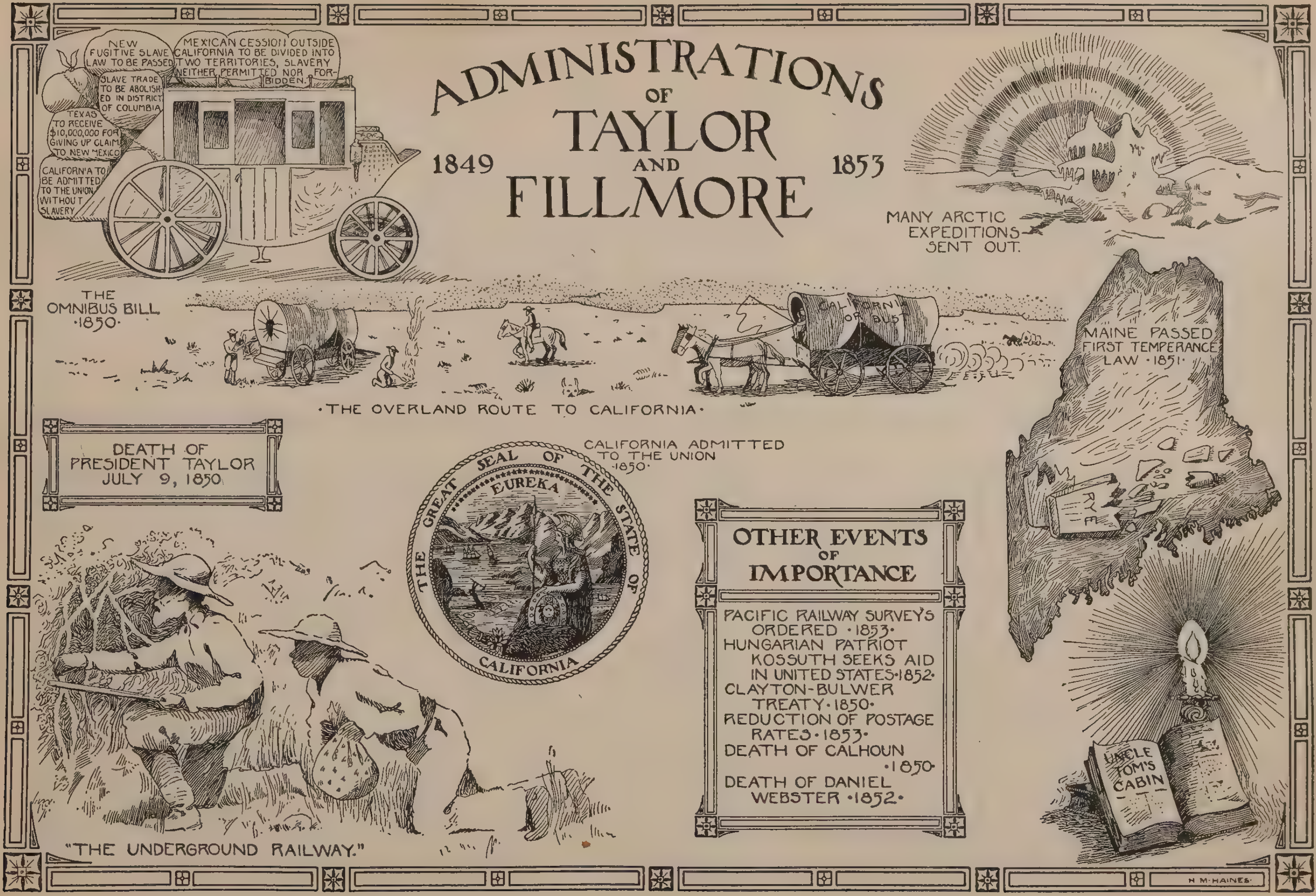
Fillmore became Vice President of the United States and president of the Senate at a time when Congress was in the throes of the slavery controversy. Personally he objected to the extension of slavery, but he fully agreed with Clay in the matter of compromising with the South, for he believed that to make concessions was the only way to save the Union from disruption. It is significant that he was so fair and unbiased while presiding over the Senate debate on Clay's Compromise Bill of 1850 that no one knew on which side he stood. In the midst of the debate he was called to the Presidency by the death of Taylor (1850).

Fillmore began his administration by selecting a strong Cabinet, headed by Daniel Webster. As Senator, Webster had exerted his influence for the passage of the Compromise, or Omnibus Bill, as it was called, making his last great speech in its favor, and Fillmore signed all of its provisions as soon as it passed Congress. His Northern Whig friends, however, disapproved of his signing the Fugitive Slave Law, and through this act he lost their support. The other important events of his administration were a treaty with Japan opening up that country to trade, reduction of the postage rates, beginning of the building of Pacific railways and the publication of *Uncle Tom's Cabin.*

Though Fillmore desired a renomination, the Whigs chose Scott as their standard bearer in the campaign of 1852, and their ticket was defeated. In 1856 Fillmore was nominated by the Whigs and Know-Nothings, but Buchanan won the election. He then retired to private life in Buffalo.

Related Articles. Consult the following titles for additional information:

Clay, Henry
Compromise of 1850
Kossuth, Louis
Political Parties in the United States
Tariff



ADMINISTRATIONS OF TAYLOR AND FILLMORE

1849 1853

NEW FUGITIVE SLAVE LAW TO BE PASSED
MEXICAN CESSION OUTSIDE CALIFORNIA TO BE DIVIDED INTO TWO TERRITORIES, SLAVERY NEITHER PERMITTED NOR FORBIDDEN.
SLAVE TRADE TO BE ABOLISHED IN DISTRICT OF COLUMBIA
TEXAS TO RECEIVE $10,000,000 FOR GIVING UP CLAIM TO NEW MEXICO
CALIFORNIA TO BE ADMITTED TO THE UNION WITHOUT SLAVERY
THE OMNIBUS BILL ·1850·
MANY ARCTIC EXPEDITIONS SENT OUT.
CALIFORNIA OR BUST
·THE OVERLAND ROUTE TO CALIFORNIA·
MAINE PASSED FIRST TEMPERANCE LAW ·1851·
RYE
DEATH OF PRESIDENT TAYLOR JULY 9, 1850
CALIFORNIA ADMITTED TO THE UNION ·1850·
THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA
UNCLE TOM'S CABIN
"THE UNDERGROUND RAILWAY."
H. M. HAINES.

OTHER EVENTS OF IMPORTANCE

PACIFIC RAILWAY SURVEYS ORDERED ·1853·
HUNGARIAN PATRIOT KOSSUTH SEEKS AID IN UNITED STATES·1852·
CLAYTON-BULWER TREATY·1850·
REDUCTION OF POSTAGE RATES·1853·
DEATH OF CALHOUN ·1850·
DEATH OF DANIEL WEBSTER ·1852·

Administration of Millard Fillmore
1850–1853

- I. The President
  - (1) Birth
  - (2) Ancestry
  - (3) Training
  - (4) Public career
  - (5) Character
  - (6) Death
- II. Govermental Affairs
  - (1) Foreign
    - (a) Treaty with Japan
      - (1) Beginning of trade relations with the United States
    - (b) Relations with Austria
      - (1) United States agent watching Hungarian Revolution
      - (2) Austria's protest
      - (3) Webster's famous reply
      - (4) Aid for Kossuth
  - (2) Domestic
    - Reduction of rates of postage
- III. Internal Affairs
  - (1) Operation of the Fugitive Slave Law
  - (2) Uncle Tom's Cabin
  - (3) Maine prohibits sale of liquors
  - (4) Visit of Kossuth
  - (5) Deaths of Clay and Webster
  - (6) Beginning of Pacific railways
- IV. Election of 1852
  - (1) Importance of conventions
    - (a) For candidates
    - (b) For platforms
  - (2) Issues
  - (3) Candidates
    - (a) Scott
    - (b) Franklin Pierce
  - (4) End of the power of the Whig party

FIL'TER, a contrivance or substance for taking from water impurities or solid particles held in suspension. Spring water is filtered naturally by being passed through beds of sand and gravel in the earth; but rain water, lake water and river water should be artificially filtered before it is used. One of the best of the manufactured filters is that invented by Pasteur, a celebrated French bacteriologist. This filter consists of a vessel of very thin porous earthenware enclosed in a metallic tank. When it is fastened to a water faucet the water pressure forces the water through the filter into the tank, from which it is drawn off as required by means of a spigot.

A filter can easily be constructed with materials within the reach of almost every one. An ordinary flower pot of large size can be converted into a useful filter in the following manner: Fill the hole with sponge. Into the bottom of the pot put a deep layer of powdered charcoal; above this put a layer of clean sand, and on top of this a layer of gravel. Pour the water to be filtered into the pot and underneath the filter put a vessel into which the filtered water may drip. The filtering material should be changed frequently.

FINCH, a general name for the large group of birds known as seed-eaters. They inhabit all parts of the globe, and are distinguished by their sharply pointed, conical and usually strong bills, suitable for crushing seeds and other hard objects. There are about 550 species, which have been classified into several subfamilies and many general. Though most of them are sober in their coloring, some are particularly brilliant, and many of them are fine singers. To this group belong the canary, chaffinch, goldfinch, bunting, crossbill, grosbeak, linnet, sparrow and many other species. See the article Bird, for lists of birds described in these volumes.

FIND'LAY, Ohio, founded in 1829, is the county seat of Hancock County, forty-four miles south of Toledo, on the Blanchard River and on the Lake Erie & Western, the Cincinnati, Hamilton & Dayton, the Big Four, the Toledo & Ohio Central and the Findlay, Fort Wayne & Western railroads. The city is in a region having oil and natural gas wells, besides deposits of building stone, lime, sand and gravel. The varied industries include the Grant automobile works, a sugar factory, porcelain and clay pottery companies, and manufactures of tires, gloves and carriages. There are other factories of lesser note. Findlay was incorporated in 1837. It has a public library and a hospital and is the seat of Findlay College, which is under the auspices of the Church of God. Population, 1910, 14,858; in 1920, 17,015.

FINE, a cash penalty, exacted either in punishment of, or in compensation for, an offense, whether committed against an individual, in contravention of the laws of the community, or against the community itself. Sometimes a prison or jail sentence accompanies a fine.

FINE ARTS, the arts which appeal to man's sense of beauty and whose object is to give pleasure. In the history of mankind the fine arts developed early. In fact, the artistic impulse may be said to have first manifested itself when the cave dweller with colored chalk drew crude pictures on his walls to relieve their gloom and divert himself through the long evenings. Then, as now, art was the expression of the man himself, the activity of his leisure moments, when the pressure of outward necessity was temporarily removed. In nearly every civilized person there is a craving for beauty, though the craving is often perverted. In its highest manifestation it finds expression in architecture, painting, sculpture, music and poetry. Art is not as it has been called, an imitation of nature, but rather the artists' impressions of nature.

FIN′GAL'S CAVE, a famous natural cavern in the island of Staffa, one of the western islands of Scotland. It extends 227 feet from its mouth inward, and is flanked by lofty basaltic columns, beautifully jointed. The height from the top of the arched roof to the mean level of the sea is sixty-six feet, the breadth at the entrance is forty-two feet, and the width at the end of the cave is twenty-two feet. This cavern is believed to have been hollowed out of lava deposits by the action of the waves.

FINGER PRINT IDENTIFICATION, a method of detecting criminals by taking impressions of the markings on the ends of the fingers. Since no two persons, so far as known, have exactly the same markings, and the prints on the fingers of an individual do not vary during lifetime, an impression of a person's finger prints is a sure and permanent record of an individual characteristic. This method of identifying criminals is now used by the detective service of every country. It is customary to have the person whose record is taken, place his fingers on a sheet of glass covered with India ink, and then press them upon white paper. An interesting tale based upon finger print identification is Mark Twain's *Pudd'nhead Wilson.*

FIN′LAND, from 1721 to 1917 a grand duchy of the Russian Empire. In 1917, after the Russians had overturned the czarist régime, Finland declared its independence. It is a small country in Northwestern Europe between Russia proper and the Scandinavian peninsula. Its southern part forms the peninsula between the Gulf of Finland on the south and the Gulf of Bothnia on the west, and it extends northward in a narrower arm nearly to the Artic Ocean, with Sweden on the west and Norwegian Lapland on the north. Its length is 700 miles; its greatest width, 400 miles. The total area is 145,686 square miles, or slightly greater than that of New Mexico. About ten per cent of the surface is in lakes. The population in 1921 was 3,400,000; nearly all of the people are Finns and adherents of the Lutheran Church (see FINNS). There are also many Swedes in the country, as well as a few Lapps and Russians.

Finland is a low, flat country, except in the north, where rolling hills rise to nearly 4,000 feet. The coast line is deeply indented, and thousands of little rocky islands are near the shores; these belong to Finland. So much of the area is covered with forests, lakes and swamps that less than five per cent is agricultural land, but on the tillable soil the people manage to subsist. It is therefore not strange that the inhabitants are not well-to-do. The products of the soil are wheat, rye, oats and potatoes. Dairying is important in the southern area. There has been but slight attempt to work the deposits or iron, copper and granite the country is known to contain. While there are great possibilities for utilization of water power, manufacturing is not developed.

History. The Finns, who are of Mongolian blood, were an independent tribe in the twelfth century, but gradually Sweden began to dominate them, and a century later it came into control of their country. Russia endeavored to take Finland many times, but not until 1721 did it gain any foothold; then it annexed a considerable territory. Not until 1809 did it wrest from the Swedes the entire province. Russian rule was characteristic. The czar named himself as grand duke of the duchy; his governors for years kept the pledge given to the Finns that their old laws and liberties should be preserved, but in 1897 a severer régime began, by which the duchy was made to feel the iron hand of autocracy. Uprisings secured a return of the privileges of home rule, but in 1910 a law was passed giving the Russian Duma control of all matters affecting Russia and Finland together. The grand duchy had its Diet, or Parliament, which passed laws of local interest. The chief executive officer was a governor-general, appointed by the czar. Woman suffrage prevailed.

In 1916 the Finns elected a new Diet of 200 members, but it was not permitted to convene. After the downfall of the czar and the rise to power of Kerensky, the Finnish Parliament was directed to open. In October, just before Kerensky was driven from power, a new election was called, in which ninety-two seats out of 200 were won by Socialists. In November the Diet voted to inaugurate a régime of complete independence, and to abolish the post of governor-general. Before a stable government could be established Finland was torn by civil war between the "White Guards," or conservatives, and the "Red Guards," or radicals, who favored a Bolshevik régime. On January 27, 1918, the latter took over the government buildings, in Helsingfors, and declared a republic of Finnish workers. Two months later a German army landed, formed a junction with the "Whites," and cleared the country of the Bolsheviks. Efforts were made to set up a monarchy with a German prince as ruler, but this plan collapsed with the defeat and surrender of Germany in the fall of 1918. The situation for the next few months was uncertain. In March a new Parliamentary election was held, in which all factions struggled desperately to obtain control of the government. General Mannerheim, who had led the White Guard, was selected as regent to take charge of affairs until a permanent form of government could be established. See RUSSIA; WORLD WAR.

FINLAND, GULF OF, a great arm of the Baltic Sea, 250 miles long and from ten to seventy miles wide, stretching from west to east between Finland on the north and Esthonia and Petrograd on the south. Its waters are only slightly salt. It contains numerous islands and has several excellent harbors and strong fortresses, which were the object of frequent attack in the World War (which see). Navigation is impeded by rocks and sand banks and by ice in winter. The ports on this gulf are Kronstadt, Viborg and Helsingfors.

FINLEY, JOHN HUSTON (1863–), a prominent American educator, was born at Grand Ridge, Illinois. He studied at Knox College and at Johns Hopkins University. He became president of Knox College in 1892 and remained in that office until 1899, when he accepted the chair of political economy at Princeton University. In 1903 he was chosen president of the College of the City of New York, and ten years later became New York State Commissioner of Education. He has served as Harvard University exchange lecturer at the Sorbonne and as president of the American Social Science Association and is a member of the National Institute of Arts and Letters. In collaboration with R. T. Ely he wrote *Taxation in American States and Cities;* and with J. T. Sanderson, *The American Executive and Executive Methods.*

FINNAN HADDIE. See HADDOCK.

FINNS, a race related to the Mongolians, forming the greater part of the population of Finland (which see). The typical members of this race are of low stature but of strong build, with round head, low, arched forehead, flat features, with prominent cheekbones and oblique eyes. Their language belongs to the northern division of the Turanian family of languages and is most nearly allied to the languages of the Lapps and Hungarians. It is agreeable to the ear, rich in vowels and diphthongs, copious and uncommonly flexible. Finnish literature is valuable chiefly for its rich stores of national poetry, and among its treasures is the famous folk epic *Kalevala* (which see).

A great impulse has been given to the cultivation of the language in modern times. It is now recognized as an official language, side by side with Swedish, and is becoming more and more the vehicle for imparting instruction. In many of the higher educational institutions for both sexes in Finland, the Finnish language is used. Works on science and history, as well as poetry, have been written in Finnish in recent years; a great Finnish-Swedish dictionary has been published, and there are now a considerable number of newspapers. The center of this literary life is Helsingfors.

FINS, the projecting, winglike organs which enable fishes to balance themselves and which assist in regulating their movements in the water. The fin is a thin, elastic membrane, supported by bony or cartilaginous rays. The breast fins are never more than two and are immediately behind the gill. In a state of rest these fins are drawn in parallel with the body and have the apex toward the tail. The terminal fins are located under the throat and belly and point downward and backward. They are smaller in general than the breast fins and sometimes have long appendages. The fins of the back point upward and backward and vary in number from one to four, to which are sometimes added several little fins, as in the case of the mackerel. Other fins are placed vertically near the tail. The tail fin, which terminates the body and serves as a rudder, assists in propelling the fish. The shape, location and character of the fin vary with different genera.

FIN'SEN, Niels Ryberg (1861–1904), a Danish scientist, the discoverer of the method of curing lupus, or tuberculosis of the skin, and other skin diseases, with light rays. In 1890 he was graduated from Copenhagen University and began at once the research which led to his wonderful discoveries. So great were the benefits resulting from his researches that the Danish government helped him to establish Medical Light Institute in a suburb of Copenhagen. There he labored until his death to perfect his methods of applying light to the treatment of disease. In 1903 Professor Finsen received the Nobel Prize for his contributions to medical science.

FIORD, or **FJORD**, *fyord,* a geographical term (of Scandinavian origin) applied to long, narrow and very irregularly-shaped inlets of the sea, such as occur on the coast of Norway, along the shores of Maine and in British Columbia and Alaska. Similar inlets of the sea are presented in the sea lochs and firths of the coast of the British Isles, and also in the fiords on the southwest coast of the South Island of New Zealand, where the scenery is singularly imposing. Fiords owe their origin to the action of glaciers in remote epochs of the earth's history.

FIR, *fur,* the popular name applied to many cone-bearing trees, particularly those evergreens with short, needlelike leaves distributed all over the stems, as distinguished from *pines,* whose foliage grows in bunches. The leaves of the fir are sharp and flat, dark green on the upper surface and light green on the under side. They grow in rows on opposite sides of the stem. The typical fir is cone-shaped, and it branches near the ground. There are a number of species.

In the United States the *balsam fir* is the common eastern species, abundant between Hudson Bay and Virginia and as far west as Minnesota. They rarely grow to a greater height than thirty feet. Canada balsam is prepared from the sap of this tree. The fir of the Pacific states is known as the *silver,* or *lowland, fir.* It is a gigantic tree, often reaching a height of 300 feet. The white soft wood of this tree is used for boxes, barrels and carpentry work. The *red fir* of the same region is of much the same character. In a single year 2,000,000,000 board feet of fir timber has been cut—value about $18,000,000 to the timberman

FIRE. When primitive man, in the lowest stages of savagery, saw forest fires which the lightning had started, he believed them to be great fire-monsters which must be placated. Later the savage discovered that fire was a most useful thing, furnishing light and heat, and he learned how to produce it and to conquer it. With its conquest mankind advanced from lower to middle savagery, and it came to be an indispensable thing through all stages of development. To-day fire is the basis of the world's industrial life, and a vital source of man's comfort, for it cooks his food and warms him in winter.

Fire is the result of the chemical union of various substances with oxygen. If we wish to make a blaze burn more brightly we fan it, because by furnishing more air and thus increasing the supply of oxygen we are providing the fire with the thing essential to it. Everyone knows that a fire is quickly smothered if a woolen cloth is thrown over it. This is due to the fact that air is excluded from the blaze. Notwithstanding the value and uses of fire in modern civilization, it is also a destructive force, and uncontrolled fires have burned up property worth countless millions of dollars. One of the important educational movements of to-day is that directed toward the prevention of unnecessary fires. Homes and industrial plants are being built with greater care, and stricter regulations are in force as to inspection and supervision of buildings. See Fire Department.

FIRE ALARM, an apparatus for announcing the breaking out of a fire. Simple fire alarms are often placed in large buildings. These are usually automatic and are so constructed that a rise in temperature beyond a given point closes the circuit which operates an electric signaling apparatus; but the fire alarm in most common use is that connected with the fire departments of cities. This consists of a central office, or signal station, containing the batteries and signal bells, which are connected with alarm boxes stationed at different places in the city. The alarm boxes are of iron and are closed with two doors. When necessary to "turn in" an alarm, the box is opened, and the handle, which is either a crank or a hook, is pulled down. This turns a wheel which closes the circuit and rings the gong in the central office and another in the engine house in the district in which the alarm box is located. The gong gives a number of strokes corresponding to the number of the box from which the alarm is sent in, and at the same time a recording apparatus in the central office indicates the number of strokes. If additional alarms are required, they are sent from the central office.

FIRE'ARMS. See Arms and Armor; Cannon; Gun; Machine Gun; Musket; Pistol; Revolver; Rifle; Shotgun; and other kindred titles.

FIRE'BIRD. See Baltimore Oriole.

FIRE CLAY, a compact kind of clay, consisting chiefly of silica and alumina, capable of sustaining intense heat and used in making fire bricks, gas retorts and crucibles, and for lining blast furnaces. Fire clay belongs to the coal formation and always forms a stratum immediately below each seam of coal. See Clay.

FIRE'CRACKERS, toy bombs, consisting of cylinders of paper, enclosing an explosive powder, which is ignited by a fuse projecting from one end. The Chinese or Hindus were the first makers of fireworks, and probably gunpowder or something like it was burned on festival days several thousand years ago in China. Firecrackers were sold in great quantities in America for many years, and were used chiefly in celebrating the Fourth of July. With the progress of the movement for a quieter Fourth their sale has declined.

They range in size from about ½ an inch to more than 1 foot in length, and from ⅛ of an inch to 3 inches in thickness. The tube of the cracker is made of strawboard, the fuse is spun cotton, soaked in a mixture of starch and gunpowder, and the explosive is a mixture of powdered charcoal, bichromate of potash and chlorate of potash. In the Dominion of Canada in many places firecrackers are used on Victoria Day (May 24) and also on Dominion Day (July 1). See Fireworks.

FIRE DAMP, the name given by miners to light, carbureted hydrogen gas, marsh gas or methane, generated by the decomposition of partially-carbonized coal. It is sometimes very abundant in coal mines, and is frequently productive of the most dreadful results, for if mixed with air it is highly explosive and takes fire readily from an exposed flame. In many cases it has occasioned explosions and caused hundreds of deaths. The miner's safety lamp affords the chief protection against this gas.

FIRE DEPARTMENT, the organization and appliances for extinguishing fires. The fire department of a large city is a highly organized body, under the control of a chief and several assistants. It is usually divided into companies, each under the immediate control of a captain. One or more of these companies occupy a fire station, where also the fire engine, hose cart and other material are kept. When an alarm of fire sounds, the horses are released and the doors to their stalls are opened by electrical devices. The horses are trained to take their places at the pole, and the harnesses which are suspended over these positions are released and instantly clasped in their proper places. Within a few seconds from the time the alarm is sounded, the men have reached the engine and hose cart; those who are in sleeping rooms and rest stations on an upper floor slide by poles from the loft above. On reaching the scene of the fire the engine is connected by hose with the hydrant of the waterworks, and other hose is stretched from the engine to the burning building. Through this, water is pumped by the engine upon the flames. Ladders, water towers and chemical engines are also used.

In some villages and small cities so-called volunteer departments are maintained. The members donate their services, though they are often granted a remission of part of their taxes in return. Though employed in ordinary occupations, they assemble at the alarm of fire and get the apparatus into position and manage the fighting of the flames. See Fire Engine.

FIRE ENGINE, an engine for throwing water to extinguish fires. A fire engine is simply a strong force pump, with the necessary machinery for working it and supplying it with water, which is forced through the hose at high pressure. The older types of fire engines were worked by hand, and the majority of the fire company gave their attention to working the pumps. Now nearly all fire engines are operated by steam. The engine consists of two pumps attached to a steam engine and the whole mounted upon a wagon. The water is carried to the fire through strong rubber tubes about four inches in diameter, called *hose*. Several hundred feet of hose accompany every engine. The largest fire engines will pump 1,300 gallons a minute and throw a stream of water as high as a five-story building, while the smallest size will throw about 300 gallons a minute. The first steam fire engine operated in the United States was in Cincinnati, in 1850.

FIRE ESCAPE′, a contrivance for enabling people to escape from the upper part of a building when it is on fire. Many patterns of fire escapes have been placed in use. The most common pattern consists of an iron ladder, attached to the building, with a platform or balcony at every story. A new pattern for schools is a cylindrical form, built on the plan of a "chute-the-chutes" into which children can climb and slide to safety. Fire departments use systems of extension ladders, as well as tubes made of sailcloth, through which persons can make an easy descent. All states have stringent laws requiring all buildings to be equipped with fire escapes, if four or more stories in height.

FIRE EXTIN′GUISHER, an apparatus for extinguishing fire by means of water charged with gases that kill flame. The fire extinguisher consists of a cylinder which will hold four or five gallons. When the cylinder is charged it is filled with water, into which is put about a pound of common cooking soda. A bottle holding about half a cup of sulphuric acid is fastened in a frame which is attached to the cup. When the cup is screwed in place the extinguisher is ready for use. When the extinguisher is wanted the bottle is emptied by pulling a rod which passes out through the cup. The acid acts upon the soda in the water and sets free a large quantity of carbonic acid gas, which creates a pressure and forces the water out through small holes at the bottom of the cylinder. Fire extinguishers are useful in extinguishing small fires. A larger pattern, sometimes called the *chemical engine*, usually is a part of the equipment of the fire department of large cities.

FIRE′FLY, a beetle which has the power to give off light in the darkness. There are several species of beetles to which this name is applied. No one knows exactly how the spark is produced, but the light-giving apparatus consists of a system of air tubes and nerves, embedded in fatty tissue. The nerves stimulate the air tubes, and oxygen is conveyed by them to the tissue. In Europe and South America there are fireflies having no wings, but those in America are winged. It is said that the natives in the tropics put fireflies in bottles and use them as lanterns. Lightning bugs and glowworm are other names frequently applied to light-giving insects.

FIRE INSURANCE. See INSURANCE.

FIRELESS COOKER, a device for cooking food with the minimum expenditure of heat. It consists of a box which can be tightly closed, and which is stuffed with hay or some other substance which will not conduct heat, space being left for one or more covered kettles. The food is boiled for a few minutes, until it is heated through, and is then covered and placed in the cooker, which keeps in the heat and allows the food to cook slowly. Meats which are not the more tender cuts; vegetables which require long cooking, as cabbage or dried beans; hard cereals, as rice or cracked wheat, are improved by cooking in a fireless cooker, and are far more economically prepared.

How to Make a Cooker. A homemade cooker can be devised with little expense. Select a wooden box and give it a hinged cover. For the inside container, in which the pot or other cooking dish is to be placed, use a strong pasteboard cylinder. Pack hay, excelsior, newspapers or other material around the cylinder, bringing the packing up to a level with the top of the container. The latter should be four inches below the lid of the box. The space in between should be occupied by a cushion stuffed with cotton or excelsior. Kettles with two compartments, especially made for fireless cookers, may be purchased.

FIRE-PROOFING, a process by which substances are made proof against destruction by fire. A surface of asbestos (which see) is the best fire-proof material, though silicate and tungstate of soda, borax and phosphate of ammonia will temporarily resist considerable heat. If wood is thoroughly soaked in silicate of soda it will not scorch for some time under even intense heat.

After the Iroquois Theater fire in Chicago in 1903, in which 575 people lost their lives, laws were speedily passed everywhere requiring asbestos curtains for theaters. No successful fire-proofing material has been found for clothing, but fabrics may be made partially fire-proof by being soaked in a solution of tungstate of soda or sulphate of ammonia.

FIRE′WORKS, preparations of gunpowder, charcoal, sulphur, saltpeter and other substances, used for display at celebrations of a public character. They may be divided into simple hand pieces, such as squibs, crackers, rockets and Roman candles, and arranged "pieces," which are contrived with much skill and ingenuity to represent, when ignited, various devices and pictures.

FIRE WORSHIP, one of the earliest forms of worship among mankind. Nearly all primitive peoples have at some stage of their development worshiped fire. Sometimes this worship has taken the form of devotion paid to the physical element fire; often the veneration has been paid to a god of fire or to some spirit supposed to preside over fire or to reside in it. Certain native tribes of West Africa and also the savage tribes of the American Indians paid homage to a fire spirit. Among other recent examples of fire worship was the Polynesian and Mexican worship of a god of fire. Sacred rites glorifying fire were performed by the ancient Egyptians, Assyrians, Chaldeans and some half-civilized Mongolian tribes. Many of the primitive peoples of Asia and also of Europe, including the early Greeks and Romans, had fire rituals. Among some early peoples, such as the followers of Zoroaster, fire was merely a symbol of divinity.

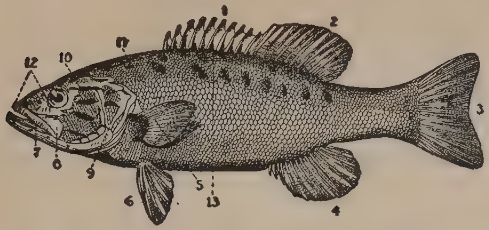
FIRST AID TO THE INJURED. The first and absolutely essential thing to do in case of serious accident or injury is to summon a reliable physician, but often before his arrival steps may be taken which will be of very great benefit to the patient. These will be found described in special articles upon the emergencies which are of most frequent occurrence. Thus, the antidotes for common poisons are described in the article ANTIDOTE. See, also, BURNS AND SCALDS; ARTERY; VEINS; DROWNING; SUNSTROKE; WOUNDS; FAINTING.

FISH AND FISHERIES. Among the vertebrates (back-boned animals), the fish are lowest in order of intelligence, but among the most important from an economic standpoint. From earliest historic times men have used the flesh of fish as food, and to-day there is hardly a country in the world whose people do not include it in their diet.

Characteristics of Fish. Fish constitute the class *Pisces,* which is divided into about 13,000 species. All are back-boned animals, living in water. Notwithstanding the numerous species, fishes show a remarkable uniformity in appearance, for the greater number have elongated, compressed bodies, tapering toward both ends, with paired fins to take the place of limbs. This form of body is well adapted to meet the pressure of water. The body is generally covered with scales or bony plates, though a few species lack such covering.

With the exception of a small family of fresh-water fish, which possess both lungs and gills, fish breathe wholly by means of gills, which are designed to extract oxygen from the water (see GILLS). They have cold, red blood, which is pumped through the system after being purified by passage through the gills. The backbone is composed of vertebrae, and is so loosely jointed that the body can be turned and bent freely in all directions. Fish possess in their air bladder, or *sound,* an organ peculiar to themselves, which they are able to fill or empty at will. Authorities are not certain as to the purpose of this organ, but some scientists believe that it is used as a balance. The skeletons of some families of fishes are not of bone, but of a strong, thick cartilage.

Geological investigations show that there have been many thousands of species of fish now wholly extinct, but the 13,000 that survive are distributed throughout almost all the waters of the earth. Those in temperate or tropical waters are more brilliantly colored and strikingly marked than the inhabitants of colder waters. In most species the colors increase in intensity and beauty during the breeding season, much as the plumage of a bird grows bright. Some fish feed on both animal and vegetable matter, others are flesh-eaters, and some eat only vegetable food. They reproduce by eggs, these being laid in shallow water. The eggs are usually left uncared for, though some species, like the stickleback, gather the eggs in nests and protect and care for their young. Millions of eggs are laid by a single fish, but the young are preyed upon by so many enemies that relatively few survive. In size fish vary from tiny minnows, an inch or so in adult length, to man-eating sharks thirty-five feet long. Whales (which see) are mammals, though they bear certain resemblances to fish.



SMALL-MOUTHED BLACK BASS

1. Spiny portion of dorsal fin.
2. Soft portion of dorsal fin.
3. Caudal fin.
4. Anal fin.
5. Pectoral fin.
6. Ventral fin.
7. Mandible or lower jaw.
8. Maxillary.
9. Opercle.
10. Cheek and Preopercle.
11. Lateral fin.
12. Snout.
13. Depth.

Deep-Sea Fishes. Before 1872, when the British government sent out the *Challenger* expedition, deep-sea fishes were not known to any great extent, although the explorations of a few scientific expeditions of earlier date had taught scientists that there were remarkable and astonishing forms of animal life in the ocean depths. The absence of sunlight, the low, even temperature, the enormous pressure and the absence of plants all tend to establish in the denizens of these seas many peculiarities. Fluids within their tissues enable them to resist the great pressure upon them, and their bones contain a large amount of cartilage.

Most of the deep-sea fishes are dark-colored, and there is less variation of color than in those which live near the surface. Some of them are blind, as no light penetrates to the depths in which they live, and those that do have eyes are believed to see by means of phosphorescent light, which is shed by the bodies of large numbers of deep-sea creatures. Sensitive organs of touch, large jaws and formidable teeth are common characteristics.

Fisheries. The capture of fish for economic and commercial purposes is an important industry all over the world. It is estimated that fresh-water and ocean fish having a value of $400,000,000 are caught every year. With the expansion of the fishing industry have come new developments in regard to conserving the supply, breeding, preserving natural spawning grounds, marketing and distribution of the product, etc. (See *Fish Culture*, below.) In regard to methods of capture, it may be said that the hook and line and nets are the devices most commonly used. In extensive sea fishing the familiar hand line is replaced by the long "set" line, having attached to it at intervals shorter lines with hooks. Sometimes a fishing schooner will operate lines aggregating several miles in length and provided with 10,000 or more hooks. Of the nets now in use the most important are the seine, the drift, the trawl, the weir and the trammel nets (see NET).

In a broad sense, the term *fisheries* includes the capture of various forms of water animals not included in the group of fish proper, such as sponges, corals, pearls, oysters, clams, mussels, turtles, whales and seals. (These are treated under their respective titles.) Salmon, whitefish, sturgeon, trout, pike and perch are among the most important fresh-water fish, and the herring, cod, haddock, mackerel and halibut take high rank among sea fish.

Fisheries have generally been considered so important a factor in national wealth that governments have been careful to protect and encourage them in various ways. The right to various fisheries has often been a matter of international dispute, negotiation and treaty. Fisheries belonging to particular governments, especially inland fisheries in lakes and rivers, are also frequently protected by laws relating to the mode and time of capture, which vary with the particular circumstances.

United States. Canada and the United States together produce about one-fourth of the world's recorded output of fish, and the annual catch from their waters has a total value of over $160,000,000. The annual value of the American catch, including Alaska and outlying possessions, is over $125,000,000. Fish to the value of $25,000,000 are shipped out in a year from American ports. The capital invested in American fisheries is about $75,000,000, and the industry gives employment to 220,000 persons. The yearly value of sea foods turned out by canneries is $50,000,000.

The waters along the New England states have been worked since colonial days, and

Outline on Fishes

I. GENERAL DESCRIPTION
  - Form of body
  - Blood
  - Heart
  - Gills
  - Fins
  - Scales
  - Vertebræ
  - Bladder or sound
  - Coloring
    - (a) Deep-sea
    - (b) Fresh-water
  - Eggs
    - (a) Where laid
    - (b) How cared for
    - (c) Number

II. PRINCIPAL PRODUCERS
  - (1) United States
    - (a) Massachusetts
    - (b) Virginia
    - (c) New York
    - (d) Other states
  - (2) Japan
  - (3) Great Britain
  - (4) Russia
  - (5) France
  - (6) Canada
  - (7) Sweden and Norway

III. FISHERIES IN THE UNITED STATES
  - (1) Government control
    - (a) By national government
      - (1) Bureau of Fisheries
    - (b) By states
  - (2) Divisions
    - (a) New England
    - (b) Middle Atlantic
    - (c) South Atlantic
    - (d) Gulf states
    - (e) Great Lakes
    - (f) Mississippi River
    - (g) Pacific coast
    - (h) Alaska
  - (3) Products

IV. FISHING INDUSTRIES
  - United States
  - Great Britain
  - Canada

V. SALT-WATER FISH
  - Cod
  - Herring
  - Halibut
  - Mackerel
  - Haddock, etc.

VI. WATER ANIMALS (NOT FISH PROPER)
  - Corals
  - Pearl Oysters
  - Whales
  - Turtles
  - Sponges
  - Seals

VII. FRESH-WATER FISH
  - Salmon
  - Trout
  - Whitefish
  - Sturgeon
  - Eel
  - Pickerel
  - Bass, etc.

VIII. FISHING DEVICES
  - Set line
  - Seine net
  - Drift net
  - Trawl net
  - Weir net
  - Trammel net

Questions on Fish and Fisheries

How do fish rank in intelligence among back-boned animals? In economic importance?

How do fishes breathe?

Is their blood like that of human beings?

Where are highly colored fish found? At what season do these colors increase in brilliancy and beauty?

How many kinds of fish are known to exist now? Have you any idea how many are extinct?

What are some of the differences between the characteristics of deep-sea fish and of fresh-water fish?

Where are some of the richest fishing grounds of the world?

What is fish culture? Why is it necessary?

What is meant by a "set" line?

What proportion of the world's fish crop is obtained by the United States and Canada?

they are the country's chief areas for the pursuit of cod, mackerel, haddock, hake, halibut, pollock, cusk, herring, tilefish and swordfish. Gloucester (Mass.) and Boston are the chief ports of the New England fisheries, which require a fleet of over 400 vessels. The Middle and Southern Atlantic coast waters are valuable areas for the capture of the Spanish mackerel, bluefish, tarpon, alewife, smelt and menhaden; the Great Lakes, of whitefish, lake trout, lake herring, wall-eyed pike, black bass, perch and sturgeon; the Mississippi Valley waters, of a wide variety of river fish; and the Pacific coast waters, of salmon, shad and tuna fish, or tunny.

Canada. The value of the annual catch of the Dominion is about $40,000,000. The coast line of the Atlantic provinces, from the Bay of Fundy to the Straits of Belle Isle, measures over 5,000 miles. Along this stretch are many natural harbors, in many of which valuable fish are taken with little effort. The Atlantic fisheries may be subdivided into two distinct classes: the deep-sea, and the inshore or coastal fisheries. Deep-sea fishing is carried on in vessels usually from forty to 100 tons. The fishing grounds are off the Grand Banks of Newfoundland, twenty to ninety miles from the coast. Trawling with hook and line, with herring and squid as bait, is the customary method of fishing. Cod, haddock, hake, pollock and halibut are the principal varieties caught. The inshore or coastal fisheries are carried on in smaller boats, with crews of two or three men, using nets, hand-lines and trawls. The principal fishes taken, in addition to those already mentioned, are herring, mackerel, shad, smelt, flounder and sardine.

On the Pacific coast salmon is the most valuable catch, but an extensive halibut fishery is carried on in the northern part of British Columbia. The salmon fisheries yield a more valuable product than any other item. Herring are abundant and provide a plentiful supply of bait for the halibut fisheries.

In addition to the immense salt-water fishing area, the fresh-water area includes 220,000 square miles, abundantly stocked with many food fishes. In this connection the reader may be surprised to learn that the Canadian waters of the Great Lakes—Superior, Huron, Erie and Ontario—form only one-fifth of the total area of fresh-water lakes of Canada. The principal fishes caught are whitefish, trout, pickerel, pike and sturgeon. Fresh-water herring are found in Lake Erie and Lake Ontario.

Fish Culture is carried on systematically in all countries having important fisheries. It includes the breeding, rearing, distribution and protection of water animals to insure their maintenance and to increase the supply of useful species. There are over 400 hatcheries in Europe, most of them under private control. In the extent of fish culture operations the United States is the leading country in the world.

United States Fish Commission. This commission is a division of the Department of Commerce, and its chief official is known as the United States Commissioner of Fish and Fisheries. His reports of the operations of the commission show the important work being accomplished by this Bureau. Special attention is given to the propagation of fish. In 1916, for example, fish were distributed to every state in the Union, and in the following year trout eggs were sent to Japan and to Canada, and various other species to the Canal Zone. Thirty-six hatcheries are maintained by the commission, where eggs are collected and hatched. The young fish, or *fry,* are then sent to waters which need to be restocked. The activities of the commission include supervision also of the mussel fisheries, the pearl-button industry, propagation of lobsters, oysters and clams, the fur-seal service and a variety of marine investigations.

Related Articles. Descriptive articles on the numerous species treated in these volumes will be found under the following headings:

Alewife
Angler
Archerfish
Bass
Bluefish
Candlefish
Carp
Catfish
Cod
Devilfish
Dogfish
Eel
Electrical Fish
Flatfish
Flounder
Flying Fish
Gar
Goldfish
Grayling
Gurnard
Haddock
Hake
Halibut
Herring
Hippocampus
Jewfish
Lamprey
Lantern fish
Lumpfish
Mackerel
Menhaden
Mullet
Muskellunge
Paddlefish
Perch
Pickerel
Pike
Pilot Fish
Pipefish
Pompano
Ray
Ribbon Fish
Salmon
Salmon Trout
Sardine
Sawfish
Sculpin
Shad
Shark
Skate
Smelt
Sole
Sprat
Stickleback
Sting Ray
Sturgeon
Sucker
Sunfish
Swordfish
Tarpon
Torpedo
Trout
Tunny
Turbot
Whitefish
Wolf Fish

FISH COMMISSION. See FISH AND FISHERIES, subhead *Fish Culture.*

FISHER, HARRISON (1875–), an American illustrator who has won great popularity through his attractive studies of the

American girl. He has made over a thousand pictures, showing many different types of his favorite subject, and does work for such popular magazines as *The Saturday Evening Post, McClure's, Ladies' Home Journal* and *Scribner's.* Fisher was born in Brooklyn and educated in San Francisco. A series of American girl drawings have been collected in a volume entitled *The Harrison Fisher Book.*

FISHER, IRVING (1867–), an American economist and professor in Yale University, who was conspicuous as a member of President Roosevelt's conservation commission in 1912. Fisher completed his preparation for teaching in Berlin and Paris in 1893–1895. He was called to Yale in 1898. One of his important books is *Elementary Principles of Economics* (1912).

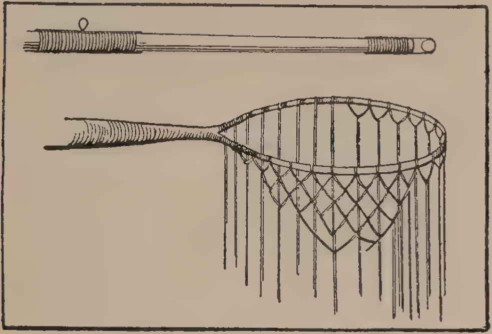
FISH HAWK, the popular name in America of the osprey, bald buzzard, or fishing eagle. It is found on both the European and American continents, near the shores of the sea or on great rivers and lakes. It nests in high trees and cliffs and lives on fish, which it captures by pouncing upon them as they swim near the surface. The general body color of the bird is a rich brown. The tail is banded with brown and white, except that of the old bird, which is pure white. The upper parts of the head and neck are whitish; a brown strip extends from the bill down each side of the neck. The under parts of the body are whitish, but the legs have a bluish cast. The fish hawk is about two feet in length and measures four feet from tip to tip of its wings. It is said that the American bald eagle often pursues the fish hawk and frightens it into dropping its prey, which the eagle thereupon seizes and eats.

OSPREY

FISHING, or ANGLING. "If I might be judge, God never did make a more calm, quiet, innocent recreation than angling," wrote Izaak Walton over 200 years ago. This famous old fisherman in a few words has voiced the sentiment of all those who think of catching fish as a game rather than a vocation. That the love of this sport is a very old sentiment is proved by various allusions in Greek and Latin writings. As early as 1496 a book was published in England on the subject, and Walton's classic on angling—*The Compleat Angler*—appeared in 1653. Of it Charles Lamb wrote, "It would sweeten a man's temper at any time to read it." To-day the sport of angling needs no defense or encouragement. It has held its place even more surely than hunting, and interest in it shows no signs of abating.

The Fisherman's Devices. Every fisherman must have a fishing-rod. To make one is an easy matter. First secure a long, straight, elastic pole. Then secure some pins and a small piece of wire. File off the heads of the pins, bend them in the shape of the letter U and drive them in the rod on the same side at regular intervals, beginning about two and one-half feet from the handle. Drive the pins just far enough to permit the line to pass freely under the loop. For the tip use the piece of wire bent into the form of a loop and bind it to the end of the pole. If there is enough wire on hand it is better to use it instead of pins. Loop pieces about three inches long and with more wire or strong waxed thread bind them to the rod, as shown in the sketch below.

A large wooden spool, an old tin can and a thick wire will serve to make a first-class reel. Run the wire through the spool and wedge it tightly so that it projects for one inch at one end and three inches at the other. From the side of a tin can cut a piece in the form of a cross. At equal distances from the ends punch a hole in each of the short arms, which should then be put upwards to form supports for the axle. Insert the ends of the wire in the holes so that the spool revolves freely, and then bend the long end of the wire in the shape of a crank. Bend or hammer the tin over the rod until it fits it snugly. The reel may be screwed to the rod or kept in place by wire rings slipped over each end of the tin.



POLE AND LANDING NET

The *line* is usually made of firmly twisted fine silk. To the end of this may be tied a piece of fine gut, on which the hook or hooks are fixed. For casting heavy bait the line is a little heavier and the gut leader is discarded. The *hook* of finely tempered steel should readily bend without breaking and yet should retain a sharp point. It should be long in the shank and deep in the bend and the barb should be long. In size and shape the hooks must be adapted to the kind of fish that are angled for. In still fishing, *floats* formed of cork, goose and swan quills, are often used to buoy up the hook so that it may float clear of the bottom. For heavy fish or strong streams a cork float is used; in slow water and for lighter fish, a quill float.

Baits may consist of a great variety, natural or artificial. The principal natural baits are common garden worms, insects or small fish (as minnows). The artificial flies so much used in angling for trout and salmon are made of hairs, furs and wools of every variety, mingled with pieces of feathers and secured together by plaited wire, gold and silver thread, marking silk or wax. The wings may be made of the feathers of domestic fowls, or any others of a showy color. Some angling authorities recommend that the artificial flies should be made to resemble as closely as possible the insects on which the fish is wont to feed, but experience has shown that the most capricious and unnatural combinations of feather and fur have been often successful where the most artistic imitations have failed. Artificial minnows and spoon-shaped pieces of metal are also used by way of bait, and are so contrived as to spin rapidly when drawn through the water in order to attract the notice of the fish.

A good landing net may be made from a forked stick and a piece of mosquito netting. Almost every tree will have several branches which may be used for this purpose. Bend the two ends until they overlap and then bind them tightly with waxed twine. Sew the netting into the form of a bag and fasten the open end to the loop formed by the forks. A better net may be made by using heavy wire for the loop. This can be firmly bound to the forks by lighter wire. The best way is to bend the wire into a loop and twist the ends together, as shown in the illustration. For a handle one may use an old broom stick, or any similar rod, into one end of which a hole has been bored just large enough to allow the wire to be firmly wedged in. For the net use twine; the process is not so easy, but the net will be better. First fasten the pole in a handy place, with the loop as high as the shoulder. Cut a number of pieces of twine about eight feet long. Double each piece and slip it on the loop with the loose ends hanging down. Hang these strings at short intervals all around the loop; the distance apart determines the size of the mesh, that is, the openings in the net.

To make the net take a string from each adjoining pair and make a simple knot of them, as shown in the diagram. Continue all the way around the loop, knotting the strings in this way. Now begin on the next lower row, putting the second row of knots as far below the first row as that row was below the rim. Of course the mesh may be of any size you desire. Now take the third row, and so on until you think the net ought to begin to taper or narrow down. This is done by knotting the strings a little closer together and also by cutting off one string of a pair at four equally distant points in the same row; that is, only four strings are cut. Then continue knotting until you come to one of the cut strings; here take a string from each side of the cut line and knot all three together, being careful to make it come even with others in the same row. Cut off the single string just below the new knot, but be sure it is the right one.

Fishing, as an industry, is treated in the article Fish and Fisheries.

FISHING LAWS. See GAME LAWS.

FISKE, JOHN (1842–1901), an eminent American historian, lecturer and philosopher, born at Hartford, Conn. As a boy Fiske was noted for his precocity; he could read and enjoy Shakespeare and Milton at eight; and before he was thirteen he knew Vergil, Tacitus, Horace and other Latin authors well. He was graduated from Harvard and from the Harvard Law School, but never practiced law. From 1869 to 1879 he was connected with Harvard University in one way or another, occupying the positions of lecturer in philosophy, instructor in history and assistant librarian. In 1884 he became professor of American history in Washington University, Saint Louis.

JOHN FISKE

Fiske was early attracted by the writings of Darwin and Herbert Spencer and became one of the strongest advocates of the doctrine of evolution. One of his earliest works, *Outlines of Cosmic Philosophy,* was based on this doctrine. For more than thirty years he expounded their theories through his lectures and writings, among the latter being his *Darwinism and Other Essays.* He is considered to have contributed more than any other American writer towards making the ideas of these great thinkers understood.

Fiske ranks among the foremost historians of his time. By his exhaustive study he contributed much of value to American history. His style is exceptionally clear and attractive, and his writings are sympathetic. In some respects, however, his work is not authoritative, on account of his patriotic prejudices. His best known historical works are *Civil Government of the United States, A United States History for Schools* and *The Critical Period of American History.*

FISKE, MINNIE MADDERN (1865–), a foremost American actress, was born in New Orleans. Her parents were connected with the theater and she was on the stage from her early childhood, achieving a real success when she was but thirteen years old. Three years later she appeared as a star, but although she won some success she gave little evidence of her real talent. After her marriage to Harrison Gray Fiske in 1890, she retired from the stage for three years, and on her return to it was at once successful. She played in her husband's *Hester Crewe,* Ibsen's *A Doll's House,* and in 1897 in *Tess of the D'Urbervilles,* in which she created a great sensation. Among her plays since that time have been *Little Italy, Frou-Frou, Magda, Becky Sharp, The Unwelcome Mrs. Hatch, Leah Kleschna, Salvation Nell* and *Erstwhile Susan.* Becky Sharp was considered her greatest rôle.

FISK UNIVERSITY, an institution for the higher education of colored people, situated at Nashville, Tenn. The university was founded by the American Missionary Society and Western Freedmen's Aid Association in 1865. The university comprises normal, college, preparatory, music and industrial departments. It has an attendance in normal years of about 500 students, and a faculty of about fifty. There are over 11,860 volumes in the library. The university property is valued at about $350,000.

FITCH, JOHN (1743–1798), an American inventor, born in East Windsor, Conn. His claim to the invention of the steamboat is upheld by some people. At the outbreak of the Revolutionary War he became a gunsmith in the American army and after this was employed in several surveying and trading expeditions in the West. He later moved to Pennsylvania, where in 1785 he completed a model of a steamboat. His second boat made a successful trial trip two years later on the Delaware. In the summer of 1790 a boat built by him made regular passenger trips between Philadelphia and Burlington, with a speed of eight miles an hour. In spite of the success of his invention, Fitch was unable to get funds to carry out his plans, and he went to France, where he was to construct boats for the government, but he was unsuccessful in getting the appointment and returned to the United States. In 1817 a committee of the New York legislature decided that he was inventor of the steamboat. See FULTON, ROBERT.

FITCH, [WILLIAM] CLYDE (1865–1909), an American playwright, born in New York and educated at Amherst College. His first play, *Beau Brummel,* was produced by Richard Mansfield in New York City in 1890 with great success. Besides a large number of original dramas, chiefly of modern society, he adapted many plays from the French and

German. Of his original plays, *Nathan Hale, The Climbers, Barbara Frietchie, Captain Jinks of the Horse Marines, Her Own Way, The Woman in the Case, Her Great Match* and *The City* proved popular. Of his adaptations, the best known are *Sapho, The Masked Ball* and *Cousin Billy.*

FITCH'BURG, Mass., one of the county seats of Worcester County, fifty miles northwest of Boston, on a branch of the Nashua River and on the Boston & Maine and the New York, New Haven & Hartford railroads. There are granite quarries in the vicinity, and the manufactures include ginghams, firearms, engines, electrical appliances, machinery and tools. Over 9,000 people find employment in the factories. The Fitchburg State Normal School is located here; there is also a state armory, a Federal building, a courthouse, a library and two hospitals. Population, 1910, 37,826; in 1920, 41,013 (8 per cent gain). The city has about 10,000 French and the largest Finnish population of any city in the United States.

FITZGERALD, *fits jer'ald,* Edward (1809–1883), an English poet and translator, whose fame is due almost wholly to his translation, from the Persian, of the *Rubaiyat* of Omar Khayyam. He was of Irish ancestry and was born in Suffolk, where he spent his life in quiet seclusion. He was educated at Trinity College, Cambridge, and early devoted himself to literary pursuits and the companionship of close friends. His extreme modesty prevented him from publishing many admirable works and doubtless deterred him from writing, except when impelled by irresistible inspiration. His translation of the *Rubaiyat* appeared in 1859 and was practically his last great effort. It is a very free translation, but reproduces the spirit of the poem with faithfulness and in a style remarkable for exquisite delicacy of workmanship.

FIUME, *fyoo'me,* a seaport town at the head of an inlet of the Adriatic Sea, about forty miles southeast of Triest. From 1870 to 1918 it formed a political division of the kingdom of Hungary, but was geographically a part of Croatia. When, at the close of the World War (1919), Austria-Hungary broke up into various independent states, Fiume was claimed both by the new Jugo-Slavic kingdom and by Italy. The ultimate destiny of the town was decided by the peace conference in Paris, in May, 1919. It was announced that Fiume would be made a free city, because conflicting demands of the Jugo-Slavs and Italians could not be reconciled. This determination Italy deeply resented; D'Annuncio at the head of Italian troops took the city, determined to hold it for Italy. In November, 1920, by the Treaty of Rapallo, it was created an independent state.

Fiume has a picturesque situation in a region of great scenic beauty. It consists of an old town and a new one, the latter built along the seashore and possessing wide streets and handsome buildings. Next to Triest, Fiume is the most important seaport on the Adriatic, and over 16,000 vessels enter its harbors annually. The place is also an important manufacturing center and has prosperous tunny fisheries. Population, 1921, 49,806.

FIVE CIVILIZED TRIBES, the name commonly used by the government to designate five tribes of Indians which formerly lived under tribal condition in the Indian Territory (now a part of Oklahoma). They were for a long time practically independent republics, under the care of the United States, but in 1898 a law was passed establishing a commission to allot the lands of their reservations to individual Indians. The work of the commission proceeded rapidly, and in 1901 the final roll of the citizens in the Seminole nation was approved. The Creek roll was practically complete at the same time, and a very considerable allotment of lands had been made to the Seminole. Each citizen in the Seminole nation received $308.76, and the lands were distributed so their value should be as nearly as possible this amount. By 1907 20,000,000 acres had been divided among 75,000 claimants, and in the course of the next few years the details of allotting the land were worked out. Many of the Indians are wealthy and prosperous, as they inherited valuable oil and farm lands. They are citizens of the United States, and when America entered the World War they bought Liberty Bonds and otherwise showed their patriotism. In 1916 there were 18,185 Indian pupils enrolled in 2,285 school districts.

Related Articles. Consult the following titles for additional information:

Cherokee
Chickasaw
Choctaw
Creeks
Seminole

FIVE FORKS, Battle of, a battle of the Civil War in America, fought April 1, 1865 about ten miles southwest of Petersburg, Va. A Federal force of about 25,000 under General Sheridan opposed a somewhat smaller Confederate force under General Pickett. It was the result of efforts on the part of both Grant and Lee to secure control of the Five Forks, which commanded the only railroad communication between the South and Petersburg and Richmond. Lee stationed a small force and resisted a strong attack by Sheridan on March 31, but on the following day the Federals, after receiving reënforcements, defeated the Confederates, who lost about 5,000 men. The Federal loss was about 1,000. The result of this battle compelled Lee to evacuate Petersburg and practically led to his surrender, which occurred early in the next month.

FIVE NATIONS, The, a name given to a confederacy of the Iroquoian tribes, living along the Saint Lawrence and in New York and Pennsylvania. Later the Tuscarora were added to the confederacy, and in consequence they were sometimes known by the English as the Six Nations. Their organization, according to their traditions, had been established by Hiawatha, and his work was so thoroughly done that even to-day, notwithstanding all the changes that have been brought about by the white man, the confederacy still exists among the survivors. The Huron, though of Iroquoian stock, were not members of the league, but were continually at war with it. In 1609 Champlain helped the Algonquins in a war against the Iroquois, and thereby gained for the French the lasting enmity of the Five Nations. As a result most of the tribes fought for the English in the French and Indian War, and they also gave aid to the English in the Revolution.

Related Articles. Consult the following titles for additional information:

Cayuga
Huron
Iroquoian Indians
Mohawk
Oneida
Onondaga
Seneca
Tuscarora

FIVES. See Handball.

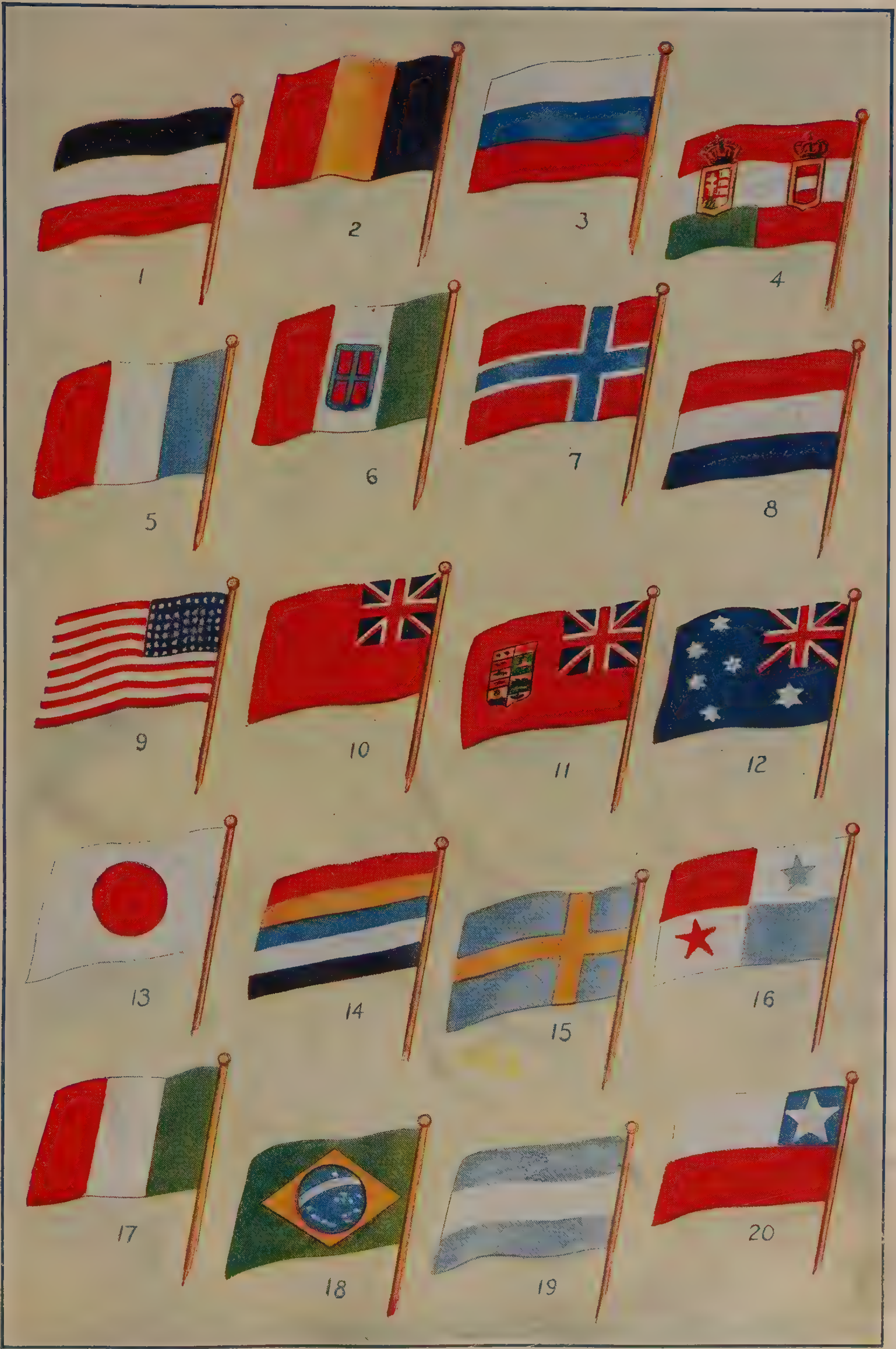
FIXED STARS, those stars which appear to remain always at the same distance from one another and in the same relative position. The name comprehends, therefore, all the heavenly bodies, with the exception of the planets, their moons and the comets. See Stars.

FJORD, the Scandinavian form of the word fiord (which see).

FLAG, a symbol of nationality, rank, organization or religion. The term is most definitely associated with the emblem which represents country, with which is linked the sentiment and history of the ages. There are, however, many kinds of flags besides the Stars and Stripes, the Union Jack, the Tricolor and other national emblems. In armies different regiments have their special banners; the flags borne on the masts of vessels include those which designate the country to which they belong, and also those which denote the rank of the commanding officers. In the United States navy blue flags, with four, three and two white stars, are borne at the main, fore and mizzen, by the ships of admirals, vice-admirals and rear-admirals, respectively. Any officer commanding a vessel, except one on board of which a flag or broad pennant may be borne, flies a narrow pennant at the main. When powder is taken on board a merchant vessel, a red flag is hoisted at the fore. The President's flag is blue, and bears the United States coat-of-arms; that of the Secretary of the Navy is a flag of blue, bearing an anchor in the center of a group of four white stars.

A yellow flag is the quarantine flag. A flag reversed is a sign of distress. To lower, or *strike*, the flag is to pull it down or take it in, out of respect or submission to superiors. To strike a flag in an engagement is a sign of yielding. A sign of mourning is to hoist the flags only part of the height of the masts; if on land, half the height of the staff. Flags are the recognized means of signaling at sea, where, by international codes, ships may communicate on every necessary subject. Each nation, too, has its own private code. *Dipping* the flag is hauling it down a few feet and then running it up again. Salutes are made by dipping. In the United States navy, when the flag is hoisted at "colors," or hauled down at sunset, the officers and men are required to salute.

Flag of Truce. This is a white flag which, when exhibited by one of two opposing armies, indicates a desire to cease hostilities



FLAGS OF THE NATIONS

1, Germany.
2, Belgium.
3, Russia.
4, Austria-Hungary
5, France.
6, Italy.
7, Norway.
8, Netherlands.
9, United States.
10, Great Britain.
11, Canada.
12, Australia.
13, Japan.
14, China.
15, Sweden.
16, Panama.
17, Mexico.
18, Brazil.
19, Argentina
20, Chile.

temporarily for purposes of communication. It has assumed a sort of sacred character, and firing upon a flag of truce is considered among civilized nations a just cause for severe retaliation. The flag is in the nature of a message from the highest commanding officer of one force to the corresponding officer of the other. The one to whom the message is sent can refuse to receive it, and the messenger after being warned not to proceed farther, is not considered immune from attack if he disobeys this order. It is considered a violation of international law, also, to use the flag of truce for any other purpose than direct and immediate communication, and any attempt to secure private information by means of it is punishable by the severest measures.

How Flags Came to Be. It seems probable that almost as soon as man began to meet for common purposes some conspicuous object was used either as a symbol of the common sentiment or as a rallying point. In military expeditions, where organization was necessary, such objects were used to mark out the lines and stations of encampment, and to keep in order the different bands on the march or in battle. In the course of time certain standards became known as belonging to certain regiments or tribes or even nations, as the case might be. The standards of individual lords and rulers were used by their retainers; as these rulers increased their dominion their flags gradually assumed the character of national flags.

Among the remains of the earliest civilizations are records of ensigns or standards. From ancient carvings and paintings it appears that different companies of the Egyptian army had their own standards, which were generally objects of awe and reverence; sacred animals, boats, a tablet bearing a king's name, and other devices were raised on the end of a staff, and the office of carrying them was considered a great privilege and honor. Among the ancient Assyrians two distinct designs are known to have existed; one, a man drawing a bow and standing on a bull; the other two bulls running in opposite directions. Both Assyrian and Egyptian standards were frequently ornamented with flaglike streamers. The banners and standards of the Hebrews and other nations are frequently mentioned in the Bible. The Persians used the figure of an eagle fixed to the end of a lance, and sometimes the sun, as their divinity, was also represented. Some of the North American Indians carried eagle's feathers fastened to the tips of poles.

The standards of the Greeks and Romans show greater variety. The early Greeks bore a piece of armor fastened to a spear; in later times the cities chose emblems or letters sacred to their associations; thus the Athenians the olive and the owl, the Thebans a sphinx, and the Messenians their initial M. Among the Romans a cross piece of wood was sometimes placed on the end of a spear and surmounted by a silver hand, figures of Mars or Minerva, or portraits of generals and emperors. Figures of animals, especially the wolf, horse, bear and eagle, were carried; it was not till the days of Marius that the eagle became the only standard of the legions. The emblems were guarded in the temples and the Roman soldier swore by his emblem as by his deities. Roman generals are known to have ordered a standard cast into the ranks of the enemy, in order to rouse their soldiers to a fiercer attack for the recovery of what to them was perhaps the most sacred thing on earth.

The earliest flags were almost purely of a religious character. In fact, the aid of religion seems to have been sought to give sanctity to national flags, many of which can be traced to a sacred banner, as the oriflamme of France and the Dannebrog of Denmark. The story goes that King Waldemar of Denmark, while leading his troops to battle in 1219, at a critical moment saw a cross in the sky. It was forthwith adopted as the emblem of Denmark and called the "Dannebrog," that is, the strength of Denmark.

The standards of the early kings of France bore the blue hood of Saint Martin; later the oriflamme, the emblem of Saint Denis, was substituted. Similarly the cross of Saint George was used in England, the cross of Saint Andrew in Scotland, and the cross of Saint Patrick in Ireland. See FLAGS OF THE BRITISH EMPIRE.

Flag of The United States. On June 14, 1777, the American Congress passed the following resolution: "That the flag of the Thirteen United States shall be thirteen stripes, alternate white and red, and that the union be thirteen white stars on a blue field." With this resolution a new national emblem had its birth, one destined to become the flag of one of the greatest nations in history. The first flag is said to have been made by Mrs.

Outline on Flags

- I. MEANING OF THE TERM
- II. USES
  - (1) Primary
    - (a) Rallying point in battle
    - (b) Emblem of nationality
    - (c) Religious emblem
  - (2) Secondary
    - (a) To distinguish divisions of army in war
    - (b) To denote rank of officers in army and navy
    - (c) Private emblems
    - (d) Signs or signals
      - (1) Quarantine
      - (2) Flag of truce
      - (3) Sign of distress
      - (4) Sign of respect to superior officers
      - (5) Mourning
      - (6) Signals at sea
      - (7) Salute
      - (8) Danger
- III. HISTORY
  - (1) Ancient Standards
    - (a) Egyptian
    - (b) Assyrian
    - (c) Persian
    - (d) Greeks
    - (e) Roman
      - (1) Eagle for infantry
      - (2) Cavalry emblems
      - (3) Imperial
  - (2) Medieval flags (of cloth)
    - (a) Religious
    - (b) Knightly
  - (3) Modern national flags
    - (a) England
    - (b) Germany
    - (c) France
    - (d) Mexico
    - (e) Itay
    - (f) Spain
    - (g) United States
      - (1) Origin of national flag
        - (a) Colonial flags
        - (b) Washington's coat-of-arms
        - (c) The flag of Betsy Ross
        - (d) Flag of 1818

Questions on Flags

What were the primary uses of flags and standards?

What became the standard of the Roman legions?

How do we know that different companies of the Egyptian Army had their individual standards?

Were you to see a United States warship, how could you determine the rank of the officer in charge?

Who made the first American flag? Which navy first saluted the American flag?

What was the first recorded naval engagement under the flag? When were the colors first unfurled over a foreign country?

When was the flag first seen at a British port? What was the national emblem during the War of 1812?

Who wrote "The Star-Spangled Banner"? Who has the flag that inspired that song?

When did the flag have sixteen stars and fifteen stripes?

Why has the flag thirteen stripes? Who suggested the number of stripes?

When was the revenue flag created?

What is the color of the President's flag?

What device is borne by the flag of the Secretary of the Navy?

What flag is hoisted when powder is taken on board?

What is the color of the quarantine flag?

What is the meaning of a flag reversed?

What is the flag of truce? What does the expression mean, to "strike the flag"?

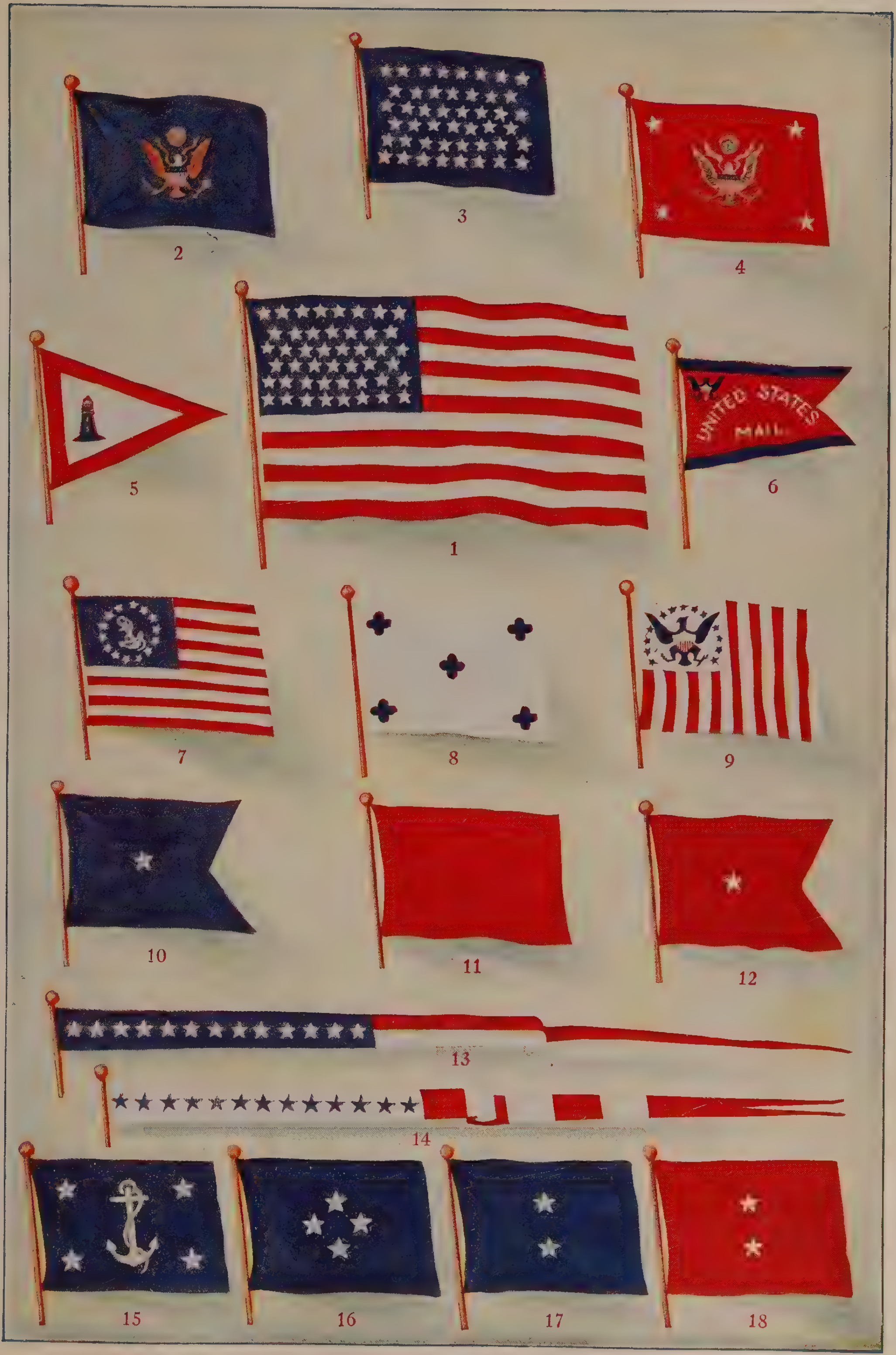
How are flags hoisted in case of mourning? What is "dipping the flag"?

Why should love for the flag of one's country be taught to every child?

In battle, why is the standard bearer in an especially dangerous position?

Why were early flags of a religious nature?

What legend is told about the flag of Denmark?



UNITED STATES FLAGS

1, National Ensign.
2, President's Standard.
3, Union Flag and Jack.
4, Secretary of War.
5, Lighthouse Service.
6, United States Mail.
7, Yacht Ensign.
8, Naval Dispatch.
9, Ensign of the Revenue Marine.
10, Former Commodore's Broad Pennant, senior in rank.
11, Powder Flag.
12, Commodore's Broad Pennant, second in rank.
13, Navy Pennant.
14, Revenue Pennant.
15, Secretary of the Navy.
16, Admiral's Flag.
17, Rear Admiral, senior in rank.
18, Rear Admiral, 2nd in rank.

Elizabeth Ross, 239 Arch Street, Philadelphia (see Ross, Betsy). The Betsy Ross flag had the stars arranged in a circle, and, as now, the stars were five-pointed. The French navy saluted the American flag February 14, 1778, when it floated from the mast of the *Ranger*, commanded by John Paul Jones.

The first recorded naval engagement under the flag was between the *Ranger* and the *Drake* (English), April 24, 1778. At Fort Stanwix (now Rome), N. Y., upon the enemy appearing unannounced on August 3, 1778, a flag was hastily constructed out of strips of sheets and bits of scarlet cloth sewed together, while out of Capt. Abraham Swartout's camlet cloak was constructed the field for the stars. The Stars and Stripes were associated with all the glory of the last days of the Revolution and waved in prophetic splendor over Yorktown. The first time colors were unfurled over a foreign country was when Capt. John Rathburne took possession of Fort Nassau, New Providence Island. The American colors were first shown in a British port by the ship *Bedford*, of Nantucket, reporting at the customhouse, London, February 6, 1783.

The national emblem during the War of 1812 had fifteen stars and fifteen stripes, the number having been increased by an act of Congress on the admission of Vermont and Kentucky, 1795. The descendants of Colonel Amstead possess the flag whose "broad stripes and bright stars" inspired the *Star Spangled Banner*, written by Francis Scott Key. On the admission of Indiana in 1816, a committee was appointed to inquire what changes were necessary to be made. At the suggestion of Capt. S. C. Reid the number of stripes was reduced to the original thirteen, and the stars increased to represent the number of states. By the following enactment, April 4, 1818, the present status of the flag was fixed:

> "Resolved, That from and after the 4th of July next, the flag of the United States be thirteen horizontal stripes, alternate red and white; that the union have twenty stars, white in a blue field; that on the admission of every new state one star be added to the union of the flag, and that such additions shall take effect on the 4th of July next succeeding such admission."

The *revenue* flag of the United States differs somewhat from the national emblem. It was created by an act of Congress, March 2, 1799, and consists of sixteen perpendicular stripes. The union bears the arms of the United States in dark blue on a white field, and in 1871 thirteen blue stars were substituted. Outside of American waters, revenue vessels may bear the national ensign in addition to the revenue flag.

FLAGEOLET, *flaj'o let*, a small wind instrument of music, played by means of a mouthpiece and finger holes. The tone produced is shrill, resembling that of the piccolo, but is softer in quality, and the range is two octaves.

FLAGG, James Montgomery (1877–), an American illustrator, portrait painter and author, born at Pelham Manor, N. Y. He studied at The Art Students' League, New York City, also in England and in Paris. Flagg has published a number of volumes of poetry and prose, illustrated with his own drawings. He has keen insight, and with a skilful technic he portrays faithfully the various phases of life that come within his observation. His fertility of ideas and unfailing humor have given him a unique place among American artists. In 1918 he made a series of drawings for moving picture production which were very favorably received.

FLAG OFFICER, the designation of an admiral, vice-admiral, rear admiral or (occasionally) a captain, in highest command of a fleet of naval vessels. As evidence of his supreme authority he flies the flag of his rank at the masthead of his vessel. See color plate, *Flags of the United States* in article Flag.

FLAG OF THE PROPHET, the sacred flag of the Mohammedans. It was originally composed of the turbans of the Koreish, captured by Mohammed; but the black curtain that hung in front of the door of Ayesha, one of Mohammed's wives, was afterward substituted. It is preserved in the seraglio at Constantinople. The carefully guarded banner unfolded at the commencement of a war is not the real sacred flag, though it is commonly believed to be so.

FLAGS OF THE BRITISH EMPIRE. The national flag of the British Empire is the Union Jack, in which the crosses of Saint George, Saint Andrew and Saint Patrick are combined. When the crowns of England and Scotland were combined under James I, he issued a proclamation that the flag of a man-of-war should be the "red cross commonly called Saint George's cross, and the white cross commonly called Saint Andrew's cross, joined together according to a form made by our heralds, and sent by us to our admiral to be published to our said subjects." This was the first Union Jack; strictly speaking, it should be called the "Great Union," and it is only a "jack" when flying from the jackstaff of a man-of-war. Probably the name of the king, "Jacques," the French for James, gave the name to the flag and then to the staff on which it was hoisted. Various changes were made by Cromwell and by Charles II, and in 1801, after the legislative union with Ireland, the cross of Saint Patrick was added, so that the arrangement of the three crosses now in use was adopted.

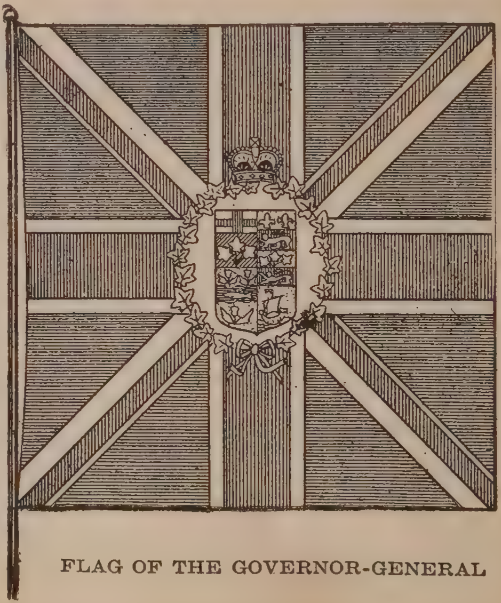
The Union Jack is the most important of all British flags and is flown by representatives of the empire all over the world. With the Irish harp on a blue shield in the center, it is the flag of the Lord Lieutenant of Ireland. The star and arms of the order of the Star of India indicate the flag of the Viceroy of India. Colonial governors use it with the arms of their colonies displayed in the center. With the royal arms in the center it is used by the British government's diplomatic representatives and also as a military flag, flown over fortresses and headquarters. When it is hoisted at the mainmast of a man-of-war it is a sign that the admiral of the fleet is on board.

The royal standard is divided into four quarters. The upper left-hand and lower right-hand quarters have three lions in gold on a red field; these are for England. In the upper right-hand quarter there is a single lion within a frame, both red on a field of gold. The golden Irish harp on a blue field is in the lower left-hand quarter.

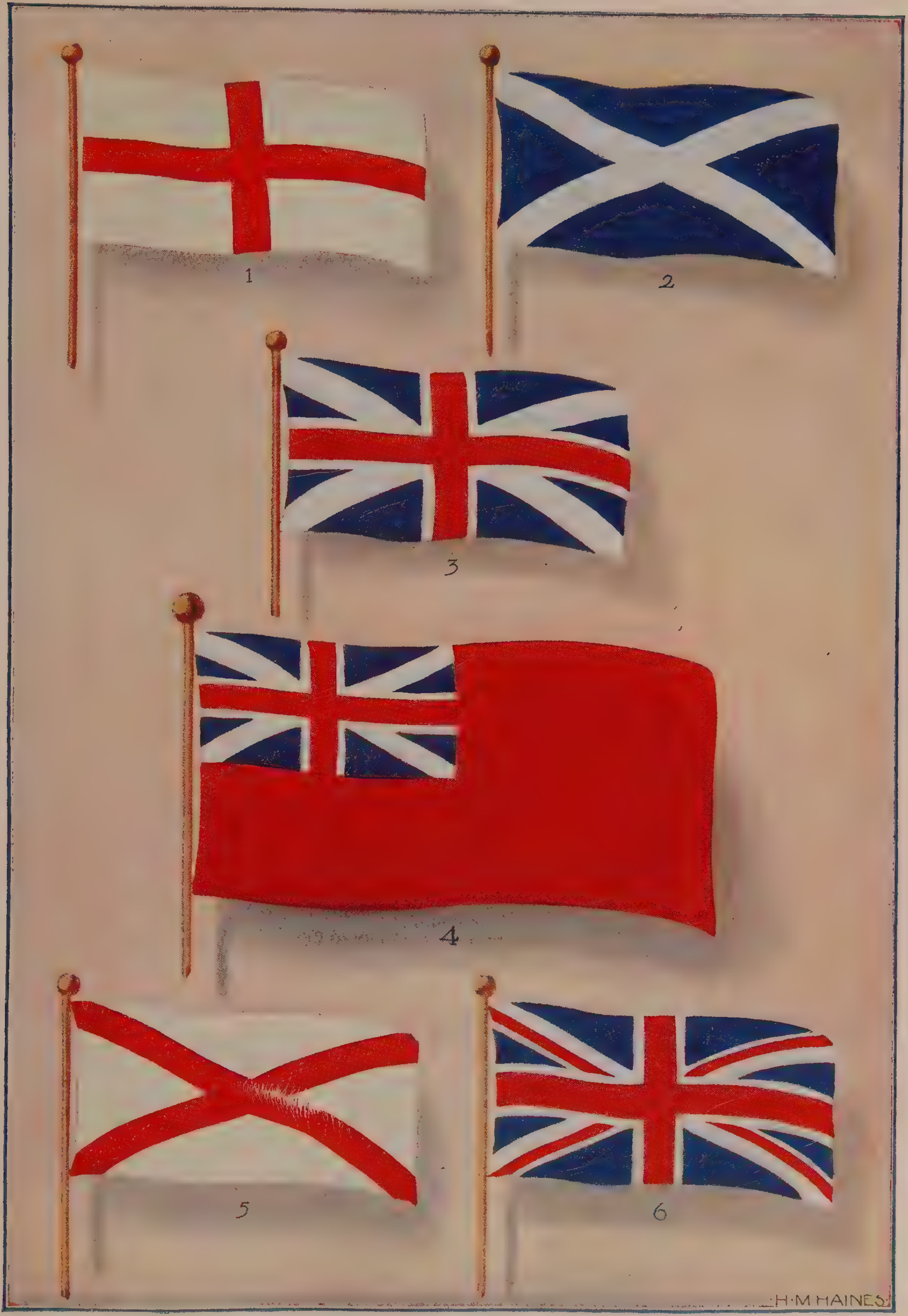
The three ensigns—the red, the white and the blue—were originally all naval. In the days of huge fleets, such as that which met the Armada, there were three admirals, each with his special ensign. The admiral in command used a plain red flag. The vice-admiral, who generally commanded the van, used a white flag, and the rear-admiral a blue one. All these three flags later bore the combined crosses of Saint George, Saint Andrew and Saint Patrick, and until 1864 they were used only by the royal navy. By a change in the regulations in that year, the navy retained only the white ensign, the mercantile marine was allowed to use the red ensign and the blue ensign was given to all vessels on public service except those of the navy. For the various departments of government, special devices are used; for instance, the telegraph uses a blue ensign on which is represented Father Time with his hour-glass shattered by lightning.

The Union Jack is flown from all fortresses and garrisons of Canada, under the charge of the colonial militia authorities. The Dominion also has authority to display on all public occasions a national flag. This is the red or blue ensign with the Union Jack in the upper corner next to the mast and the Dominion coat of arms in the field. The red ensign is used at the opening and closing of Parliament and on national occasions of any sort. As in England, the blue flag distinguishes the government vessels.

The governor-general uses a plain Union Jack with the Dominion coat of arms surrounded by a garland of maple leaves and surmounted by a crown. The Union Jack is flown at the government house at Ottawa and at the provincial capitols on ordinary occasions. On the King's birthday and on the days of his accession and coronation the royal standard is flown. The lieutenant-governor of each province has a flag displaying the provincial arms surrounded by a wreath of maple leaves on the white ground of the Union Jack. For illustrations of these flags, see the articles on the different provinces.



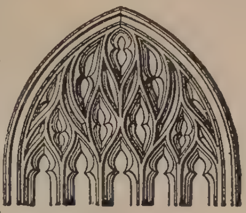
FLAG OF THE GOVERNOR-GENERAL



THE BRITISH FLAG

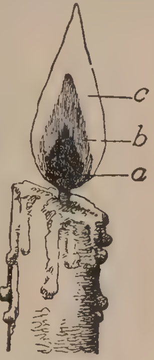
1—English Jack, Cross of St. George. 2—Scotch Jack, Cross of St. Anthony. 3—Crosses of St. George and St. Andrew, combined to make the Union Jack of Queen Anne, 1707. 4—Red Ensign of Queen Anne. 5—Irish Cross of St. Patrick. 6—Present Union Jack, a combination of the Union Jack of Queen Anne and the Irish Cross of St. Patrick.

FLAMBOY′ANT, a style of Gothic architecture common in France from the fourteenth century to the sixteenth, so called because of the flamelike forms of the tracery of windows, wall panels and other details. While it was accompanied by a profusion of ornament and decorative carving which often ran into extravagances, the fundamental principle of the flamboyant style with its rhythmic flowing lines as distinguished from the geometrical designs preceding it was a most important contribution to architectural design.



FLAMBOYANT TRACERY

FLAME, a blaze rising from a burning body, or any inflammable gas in a state of visible combustion. Flame is attended with great heat and sometimes with the evolution of much light, but the temperature may be intense with little light, as in the case of the flame of burning hydrogen. The luminosity of flame depends upon the presence of extremely small particles of solid matter (usually carbon) or of dense gaseous products of combustion. The flame of a candle consists of a dark colored cone containing gases that look dark because they are not burning, a white envelope surrounding the cone and consisting of particles in a high state of combustion, and a second and outermost cone of yellow color, in which particles of matter are heated to the point of burning (see *a*, *b* and *c*, in the illustration). When the pressure of the gas producing the flame is so great that it is all but flaring, it is found that certain sounds will cause the flame to alter its shape, thus producing *sensitive flames.*



FLAME

a, area of no combustion.
b, area of partial combustion.
c, area of complete combustion.

FLAMIN′GO, a strange-looking bird, whose body is rather smaller than that of the stork, but which, owing to its great length of neck and leg, measures from five to six feet from head to foot. There are several different species found in Mediterranean and tropical countries, all more or less red in color, but varying in size. They migrate in V-shaped flocks. Their necks are extremely slender and flexible, and their big, naked bills are bent abruptly down, as if broken near the middle. In feeding, the bird stands nearly erect, thrusting its neck downward and burying its bill and perhaps its head in the water, with the top of the bill downward. It then sways its head from side to side, causing currents of water to pass back and forth through the bill, where fine horny projections strain out the seeds and the small animals that are stirred up from the bottom by the bird's feet. The birds nest in the warm countries in large colonies, upon muddy flats near the water level. Their nests are big cones of reeds and sticks, cut off squarely at such a height that the mother bird can sit with her legs dangling down the sides, though she usually sits with them folded up beneath her.

The flamingo of North America nests in the latitude of Florida. The male has a light red plumage, whose large feathers have black quills; the females are pale pink and the young nearly white. As is the case with other beautiful birds, their handsome plumes made them sought by hunters, and laws have been passed for their protection.

FLAMINGO

FLAMIN′IAN WAY, the principal northern road which led from ancient Rome. It was constructed by Caius Flaminius the elder, in 220 B. C., during his censorship, and led from Rome to Ariminum on the Adriatic, 222 miles. Remains of it are yet extant in various places.

FLAMMARION, *fla mah re ohn',* CAMILLE (1842–), a French astronomer and author of several scientific books, many of which are written in a popular style. In his youth he studied theology and many of his books are tinged with mysticism. He has written several astronomical and spiritualistic romances. *The Unknown and Psychic Problems* and *Mysterious Psychic Forces* are typical of his style. *Astronomy for Amateurs* is an excellent book on the subject, for young people. Flammarion has edited a number of scientific magazines. In 1887 he founded the Astronomical Society of France, and was elected its first president. His more solid contributions to astronomical science embrace a work on the motions of the stars, another on double and multiple stars, and a treatise on the topography and physical constitution of Mars. Among his excellent handbooks which have been translated into English are *Marvels of the Heavens, The Atmosphere, Popular Astronomy* and *Uranus.*

FLAN'DERS, a region of Europe composed of the provinces of East and West Flanders in Belgium, the southern part of Zealand, in Holland, and two departments of Northeastern France. All of the Belgian coast line is included in West Flanders, and in that region occurred some of the most desperate battles of the World War (which see). The valiantly-defended Ypres, and Zeebrugge, noted as a submarine base, are some of the historic cities of West Flanders. The people of Flanders speak the Flemish language (which see).

East Flanders has an area of 1,158 square miles. Its soil, partly of a sandy and partly of a clayey nature, is so industriously cultivated in peace times that it has the appearance of a vast garden. The principal crops are wheat and flax. Linen, laces and damask are among the important manufactures. Ghent is the capital. Population, 1910, 1,120,335; 1920, estimated at 1,122,622.

West Flanders has an area of 1,249 square miles. The most important industry is the manufacture of linens and laces. Bruges is the capital. Population, 1910, 874,135; 1920, estimated at 887,406.

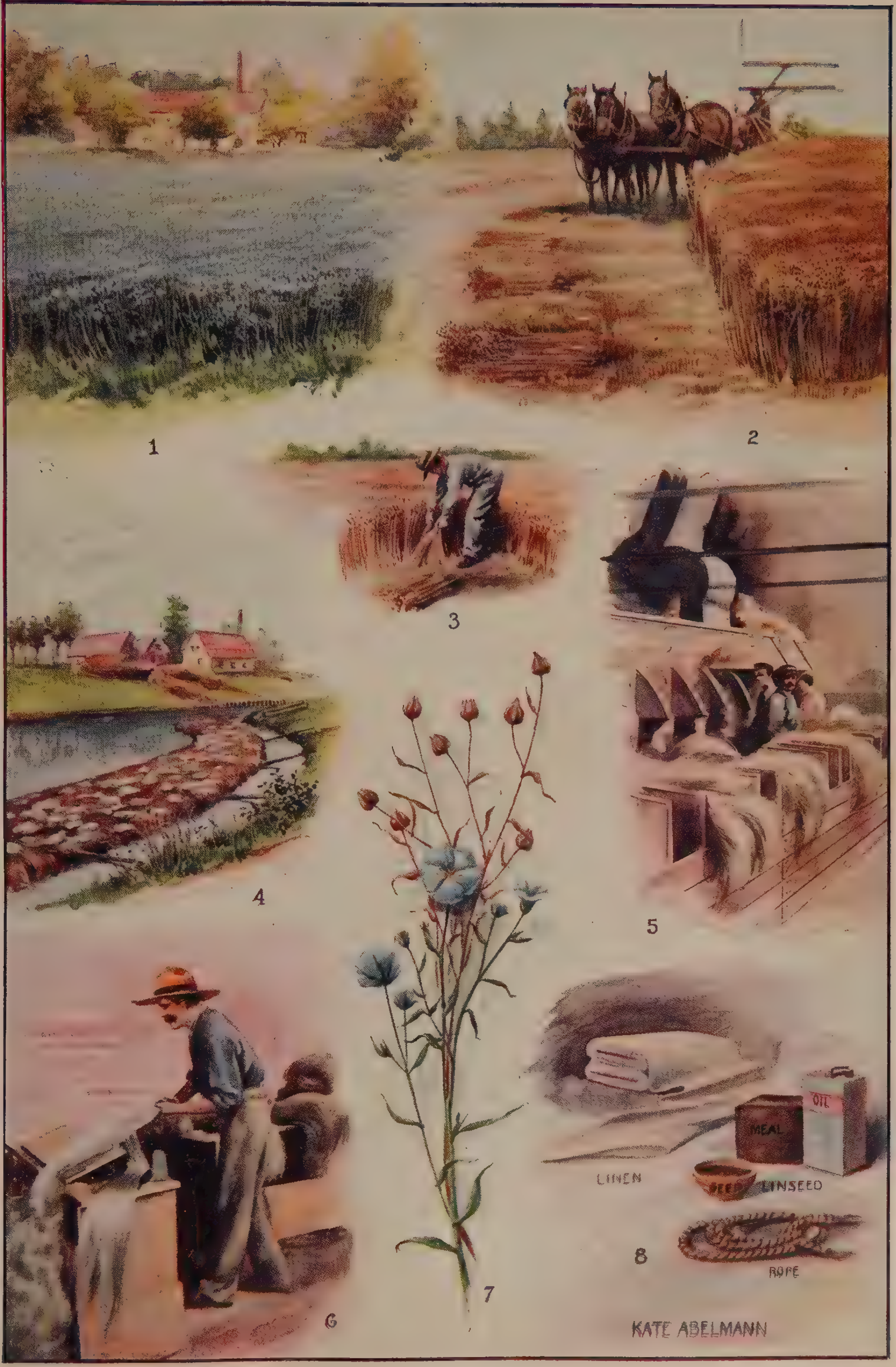
FLAN'NEL, a fabric made of wool, or of worsted, wool and silk, or wool with cotton. It is used for outer and under garments, both in cold and hot climates, because it promotes an insensible perspiration, which is absorbed by the atmosphere. The best flannels are made in Wales.

FLAT'FISH, a sea fish which has a flat body, with both eyes on one side of its head, and which swims on its side. Examples are the flounder, turbot, halibut and sole. The term is also applied to other fishes with flat bodies, such as the skate and other members of the ray family.

FLAT'HEAD, the name applied in scorn by various Western tribes to an important Salishan Indian tribe, that lived originally in Northwestern Montana. The tribes living along the Columbia River shaped the skulls of their infants by putting on each cradle a headboard of wicker which pressed the child's head into a peak. The Salish did not practice the custom of artificially deforming the head, and so earned the name *flathead.* They were a superior people, courageous but not aggressive, and fair in their dealings with the whites.

FLAX, a plant cultivated for its fiber and seed, both of which are of great commercial value. From the fiber is produced the fabric linen (which see), so widely used in making choice table cloths and napkins, towels, handkerchiefs and a great variety of articles of apparel, as well as twine, rope, cordage and sailcloth. During the World War the value of flax fiber was enhanced by the extensive production of aeroplanes, the wings of which are a strong grade of linen. In certain flax markets the fiber was quoted as high as $700 a ton, and the belligerent governments put forth special efforts to increase its production. The seed of the plant is also valuable, as it is the source of linseed oil, used in making linoleum and oilcloth, for medicinal purposes and as an ingredient of paints and varnishes (see LINSEED OIL).

The flax plant sends up a slender stem from two to three feet in height, which branches freely when the plants are not closely crowded. The flowers of most species are a beautiful blue, but in some cases white ones are borne. The cultivation of flax demands more labor than that of almost any other crop, for every step from planting to the final preparation of the fiber must have the greatest care. If only the seed is to be used, the plants may be allowed to ripen, and may then be cut with a mower (see Figure 2



FLAX
1—Field of flax in blossom. 2—Harvesting the flax for seed. 3—Pulling the flax for fiber. 4—Retting flax in a river. 5—Scene in a Belgian scutching mill. 6—Hackling the fiber. 7—A stalk in blossom; another in seed. 8—Flax Products.

of the color plate); but if the fiber is to be saved the flax must be pulled by hand before it is quite ripe, for the best of the fiber is near the roots and is harmed by the cutting process (see Figure 3 of the color plate). The pulled flax is either tied together in bundles, and left upright on the field until it is dry, when the seeds are separated from it, or the separation is made immediately after the pulling, by means of an iron comb known as a *rippler.*

Next the flax is *retted,* or *rotted,* in water (Figure 4, color plate) until the fiber may be easily removed from the woody part of the stalk, and is then spread on the grass to dry. Each process, the retting and the drying, takes from ten days to two weeks. Freeing the fiber from the core requires two operations. First the *breaking* is done by means of a wooden handle and grooved board, or by revolving grooved rollers, and then the woody part is entirely separated from the fiber by a broad, flat wooden blade, called a *scutching blade,* or by a scutching machine (Figure 5, color plate) in which a number of knives attached to the arms of a verticle wheel strike the flax in the direction of its length. The flax is next *heckled,* or combed with an iron comb, the finer fibers being produced by repeated heckling, each time with a finer comb.

The chief flax-growing countries are Argentina, Egypt, British India, Russia, Holland, Belgium, Ireland, the states of the former Austria-Hungary, the United States and Canada. For several years before the World War the annual linseed production of all countries varied from 100,000,000 to 133,000,000 bushels, and that of fiber from 1,000,000 to 2,000,000 pounds. In normal years the United States produces about 23,000,000 bushels of flaxseed, while Canada's crop varies from 4,000,000 to 17,000,000 bushels. North Dakota is the leading flax state of the America Union.

FLEA, *flee,* a very small wingless insect nearly all species of which prey upon animals. The common American flea is about one-eighth of an inch long, somewhat flattened in shape and covered with a shell composed of hard, overlapping plates. Two threadlike feelers (antennae) grow out from between the eyes. The mouth parts are adapted for piercing and sucking. Fleas are not only an annoyance, but they are a danger. It has been discovered that the bubonic plague (see PLAGUE) is transmitted through fleas from rats to men. So long as the rat is alive the fleas do not leave it, but as soon as a rat dies the fleas quickly forsake it and find new prey—domestic animals and human beings.

FLEA
(Much enlarged.)

FLEABANE, *flee'bane,* a name given to several plants, from their supposed power of driving away fleas. The *common fleabane,* whose smoke was supposed to expel fleas, is found in moist, sandy places in the south of England. The *blue fleabane* is common on dry banks. In the United States it is found abundantly in all parts east of the Mississippi River. It is also called *sweet scabious,* and other species closely allied to it are the *horseweed* and *butterweed,* or *colt's tail.* The seed is distributed by the winds and springs up in waste places and grain fields.

FLEM'ISH LANGUAGE, a form of Low German spoken by the inhabitants of Belgian Flanders (see FLANDERS) and sections of Holland. It bears a close resemblance to modern Dutch, but is distinguished by certain peculiarities of spelling and pronunciation. Since 1830 Flemish has become an important vehicle as a spoken and written language. It is of equal standing with French in legal and governmental circles in Belgium, is studied in the public schools, and has been used by recent novelists, poets and playwrights. A Flemish university was established at Ghent in 1886.

FLETCH'ER, FRANK FRIDAY (1855–), one of the admirals of the American navy. He first became popularly known when in command of United States naval vessels, as rear-admiral, at Vera Cruz, Mexico, in 1914, when trouble arose with Huerta's government (see MEXICO, subhead *History*). After being relieved of that command he became commander in chief of the North Atlantic squadron. At that time he was raised to the rank of admiral. Fletcher was graduated from the United States Naval Academy in 1875, became a captain in 1908 and a rear-admiral in 1911. During the World War his station was with the Atlantic fleet.

FLETCH'ER, JOHN. See BEAUMONT AND FLETCHER.

FLETCH'ERIZING, a method of mastication, so called because of the emphasis it has received from Horace Fletcher (1849–1919), an American writer. The most important principle in Fletcherizing is to chew one's food until it is reduced to a liquid. By this system, according to Mr. Fletcher, the many ills of indigestion, constipation, etc., will be eliminated. He also condemned overeating and eating when one is not hungry. Some authorities claim that he overemphasized the value of thorough chewing, and that too much chewing harms the teeth. On the other hand, he rendered humanity a service by arousing public interest in the subject of mastication and nutrition, and by emphasizing the evils of bolting the food.

FLEUR-DE-LIS, *flur de lee′*, the national flower of France, generally known as the iris. A conventionalized form of this lily, also called fleur-de-lis, was the emblem of the French kings. The plant has large, sword-shaped leaves and blossoms with six petals, three of them drooping and the other three standing upright. In color the flowers are a beautiful combination of lavender, deep mauve, yellow and white. They grow luxuriantly, both in a wild and a cultivated state.

FLEXIBIL′ITY, the property of certain bodies by virtue of which they may be bent. It should be distinguished from *elasticity*, which is the property enabling a flexible body to resume its original position after strain has been removed. A bar of iron is flexible, but not elastic. A young sapling is elastic; if bent to the ground and then released, it springs quickly to an erect position.

FLEX′NER, Simon (1863–), an American physician who has helped to lower the death rate by his investigations in the field of infectious diseases. One of his most notable achievements was his production of a serum for treating cerebrospinal meningitis. He also announced the discovery of the germ of infantile paralysis. Dr. Flexner was born at Louisville, Ky. He received a degree in medicine at the University of Kentucky in 1889, and later studied at Johns Hopkins University and in Germany. After serving as professor of pathology in various American universities, he took charge in 1903 of the laboratories of the Rockefeller Institute for Medical Research. In 1914 he was decorated with the French cross of Chevalier of the Legion of Honor.

FLICK′ER, a common name for the *golden-winged woodpecker*, one of the handsomest and commonest birds of the Eastern United States and Southern Canada. Its prevailing color is olive-brown, with black markings, while the rump and upper tail coverts, which it shows conpicuously in flight, are pure white. It has an ash-colored head and neck, the former barred by a strip of bright scarlet. The under parts are brown, fading toward the rear into yellow, and are marked with numerous round black spots. Across the breast and throat is a broad black crescent. The under parts of the tail and wings are a rich golden yellow.

The bird is not at all timid; it is frequently seen near dwelling houses and other occupied buildings. It has a loud and characteristic note which, once heard, cannot be forgotten. Almost every locality has its own favorite name for this bird. *High-holder, sapsucker, yellow-hammer, flicker* and *golden-winged woodpecker* are but a few of them. In the Rocky Mountains and on the Pacific coast are species varying somewhat from those of the east in color and markings.

FLINT, a very hard rock which when struck with steel produces a spark. It is a variety of quartz, and is usually of a dark bluish-gray color. It is found in rounded lumps, or nodules, in masses of other rock and is used in the manufacture of glass and fine pottery.

FLINT, Mich., the county seat of Genesee County, sixty-eight miles northwest of Detroit, on the Flint River and on the Grand Trunk and the Pere Marquette railroads and interurban lines. The city has lumber mills, grain elevators, brickyards, and manufactories of flour, wagons, cigars and other articles. It also is an important center for the manufacture of automobiles, the Buick, Dort and Chevrolet cars being made here. It has a Federal building costing $100,000, a Carnegie Library, Oak Grove Hospital and a state institution for the deaf and dumb. Flint was settled in 1820, and was chartered as a city in 1855. Population, 1910, 38,550; in 1920, 91,599, a gain of 138 per cent.

FLINT′LOCK, the name given to a gun which probably originated in Spain and was in use in one form or another from the early part of the seventeenth century to the early part of the nineteenth century. A piece of flint was fastened in the hammer, which, falling, struck a piece of steel. The sparks thus produced fell into a priming pan filled with powder, and thus exploded the charge.

FLOOD, a body of moving water which overflows land not usually covered with water. Flat lands on the sea coast and along the shores of rivers are, naturally, most exposed to danger of this sort, and history from the earliest times presents a long list of disasters from floods.

Sea Floods. These are far less frequent than river floods, but are likely to cause far more damage when they do occur. The most common cause of inundations by the sea is the bursting of dykes or sea walls in those countries which are actually below sea level at time of high tide. Parts of the Netherlands, for instance, are from sixteen to twenty feet below sea level, and only great dykes along much of the coast make the country a land area instead of a water area. In past times, when the construction of dykes was not as well understood as it is to-day, there were periodic floods which were terribly destructive. In 1421, about 100,000 people were drowned and seventy-two villages were under water. Just a century later another disastrous flood killed almost 100,000, and in 1570 about 20,000 perished in Friesland. Other causes of sea inundations are unusually high tides, or severe winds which drive the waves inland. The disaster at Galveston on September 8, 1900, in which 6,000 lives were lost and 3,000 buildings destroyed, was the result of a hurricane which piled up the waters on the coast. Earthquakes, too, occasionally give rise to sea floods, the best known example of such a disturbance being the tremendous tidal wave which followed the earthquake by which Lisbon was destroyed in 1755.

River Floods. The United States has always suffered much from the overflow of rivers; indeed, one authority estimates that for years the annual devastation from floods of the Ohio alone has averaged $50,000,000. River floods result from excessive rains, the sudden melting of ice and snow, or the bursting of reservoirs or banks. If such floods are regular, they may be quite the reverse of destructive; in Egypt, for instance, the agricultural life of the people has always depended on the overflow of the Nile (which see). The Mississippi River, too, is subject to floods, and almost a score of destructive inundations are recorded between 1828 and 1912. From Cairo to the mouth of the river levees have been built to hold the water within bounds, but an unusual rise in volume may either overtop these embankments or make breaks in them. The flood of March and April, 1912, was the most serious of which there is record. Over 15,000 square miles were flooded, many lives were lost, and property valued at $45,000,000 was destroyed.

A year later, in the latter part of March, 1913, there occurred over much of Indiana and Ohio the heaviest rainfall ever recorded there, and as a result all the streams of that region passed their flood stages, and various towns were inundated. In Dayton, O., over 150 people lost their lives and millions of dollars worth of property was destroyed. Columbus, Zanesville, Chillicothe, Delaware, Hamilton, Piqua and Tiffin, in Ohio, and Peru and Brookville, Indiana, also suffered severely. These spring floods of 1913 surpass in point of property loss any other natural disaster in the history of the country.

Flood Prevention. The chief means for the prevention of floods are the construction of reservoirs (see RESERVOIR) at stream sources, the building of leeves (see LEVEE), and the planting of trees on treeless or deforested land. The service rendered by forests in preventing floods is now recognized as one of the most important factors in checking disasters from overflows. The trees on land surrounding a stream hold the water that would otherwise flow down to the river more rapidly than it could be carried away. See FORESTRY; CONSERVATION.

FLOOD PLAIN, a plain formed by a river depositing sediment at its mouth or along its course. If formed in the upper or middle part of the river's course, the flood plain may be composed almost entirely of gravel and coarse sand, but the most extensive plains of this sort are formed in the lower part of the river's course and are composed of fine silt or alluvium. The flood plains in the lower course of the river or near it mouth are usually wider than those farther up stream. Since they follow the course of the stream, many of these plains are very irregular. In case of high water they may be flooded and covered with a new deposit of silt, or the current of the stream may become sufficiently strong to cut a new channel and cause serious damage. The flood plains along great rivers are usually densely populated, because of their fertility. The most noted of these plains are along the Nile, the Po, the Rhine and the Ganges. See DELTA; RIVER.

FLO'RA, the Roman goddess of flowers and spring, whose worship was established at Rome in the earliest times. Her festival, the Floralia, was celebrated from April 28 to May 1.

The term *flora* as a common noun is used in botany to designate the entire plant life of any region or period, as the *flora of Massachusetts* or the *flora of the Carboniferous Age*. The corresponding word for animal life is *fauna*.

FLORENCE, Ala., the county seat of Lauderdale County, 127 miles southwest of Nashville, Tenn., on the Tennessee River and on the Louisville & Nashville and the Southern railroads. The manufactures include wagons, boilers, fertilizers, cottonseed oil, pig iron, cotton yarns and cloth. There are lumbering and mining industries in the vicinity. Florence ships most of the cotton of the adjacent country. It is the seat of a state normal school and a normal school for negroes. A steel railroad and passenger bridge here crosses the Tennessee. Population, 1920, 10,529.

FLORENCE, *flaw'rens,* Italy, a city of many historic associations, celebrated as one of the great art centers during the Italian Renaissance. No other city surpasses Florence in the number of illustrious personages connected with its history. Dante, Petrarch, Boccaccio, Leonardo da Vinci, Cimabue, Andrea del Sarto, Michelangelo, Donatello, Ghiberti, Cellini, Machiavelli, Galileo, Savonarola, Americus Vespucius—these and many others of outstanding fame worked or lived in Florence at various times. The city is called by its people *Firenze la Bella,* "Florence the Beautiful." It lies in the fertile valley of the River Arno, close to the picturesque Apennines, and is 140 miles northwest of Rome.

To the art lover, Florence is a place of marvels. It possesses two world-famous art palaces, the Uffizzi and the Pitti, in which are preserved many priceless works of the old masters (see Pitti Palace; Uffizi). These two buildings are connected by a passageway which runs through the upper part of the Ponte Vecchio (Old Bridge), one of six bridges which span the Arno. In the Piazza Duomo (Cathedral Square) there are three structures of special interest—the beautiful Cathedral of Saint Mary of the Flower, the dome of which gave Michelangelo his inspiration for that of Saint Peter's; the Campanile, or bell tower, built by Giotto; and the eight-sided Baptistery, with bronze doors designed by Ghiberti. Michelangelo's statues for the tombs of the Medici may be seen in the Church of San Lorenzo, and the ancient monastery of San Marco, of which Savonarola was prior, has walls decorated with the well-known angel faces painted by Fra Angelico. Another famous church, Santa Croce, contains the tombs of Michelangelo, Galileo and Machiavelli, and the empty sepulcher of Dante.

Founded by Roman colonists over a century before the birth of Christ, Florence had become a thriving center of the goldsmith and jewelry trade by the early medieval period. Between 1282 and 1530 it was a city republic. In 1434 it fell under the sway of the Medici family, and under Lorenzo the Magnificent it became the chief center of the Renaissance movement. The plots of the Medici family caused the city to lose its liberties, and in 1530 it was captured by the army of Charles V. Two years later ducal government was set up, and in 1569 Florence was merged with the Grand Duchy of Tuscany (see Tuscany). Between 1865 and 1871 the city was the capital of the kingdom of Italy, and it is the present seat of government of the province of Florence. Population, 1915, estimated, 242,147 (including suburbs).

FLORENTINE SCHOOL OF PAINTING, the name given to a period and a group of painters in Italy in the fourteenth and fifteenth centuries. During the latter century it was the most influential factor in art in all the world. Giotto was its early exponent; there followed him Fra Angelico, Filippo and Filippino Lippi, Botticelli, Ghirlandaio Da Vinci, Michelangelo, Andrea del Sarto and others. The work of the Florentine painters was not as rich in color as was that of the Venetian school, but it excelled in composition; figures were all exquisitely modeled.

FLOR'ICULTURE, the cultivation of flowering plants for ornamental purposes. This branch of industry has developed steadily since the middle of the nineteenth century. There are now more than 7,400 establishments in the United States devoted to the raising of flowering plants, and there are hundreds of acres of land under glass (see Greenhouse). Florists do a thriving business in all large cities, especially where space for yards is limited. There is always a demand for choice flowers, and high prices are paid for rare species or plants made to bloom out of season. Some of the achievements of Luther Burbank in flower culture are told in these volumes in his biography.

FLORIDA, The Peninsula State, comprises the southeastern extremity of the American republic. Almost the entire state, with the notable exception of the Everglade region, is the winter playground of Americans east of the Mississippi River. The state is a peninsula 450 miles in length from north to south—nearly half the distance from New York to Chicago; the central part of the state is about 100 miles in width. North of Florida lie Georgia and Alabama; here the state has a width of about 375 miles. The coast line of 1,200 miles exceeds that of any other state.

The Atlantic Ocean lies on the east, the Straits of Florida are on the south and the Gulf of Mexico is west. Extending southwestward from the southern tip of the mainland for 200 miles are the Florida Keys, a line of small, low islands, most of them of coral formation. On the farthermost islet is the city of Key West. The city and islands have connection with the main line of the Florida & East Coast Railroad by a remarkable railway built on the islands and on causeways over the intervening waters.

The area of Florida is 58,666 square miles, and it had a population in 1920 of 968,470, making it twenty-first in area and thirty-second in population among the states. According to the Federal census of 1910 the population was 752,610; the increase is 28 per cent. The state flower is the orange blossom; the state motto, "In God We Trust."

Cities. In 1920 there were six cities in Florida with populations exceeding 12,000. These were Jacksonville (91,558); Miami (29,549); Tampa (51,252); Pensacola (31,035); Key West (17,749) and Saint Petersburg (14,237). Tallahassee, the capital, in the northwestern part of the state, has a population of 5,637 in 1920.

Surface and Drainage. The northwestern part of the state is hilly and rolling, being an extension of the Alabama uplands. This region descends to a low flat coast. The eastern part of the state is low and nearly level, but the surface rises from each coast towards the interior, where in some places it reaches a slightly higher altitude. The highest point in the state, near the extreme northwest corner, is 274 feet above the sea. The lands along the coast are low, level and often marshy. They have been formed by gradual elevation from the ocean and by the action of lime secreting organisms. This strange formation is still going on, as seen along the coast and in the growth of the Florida Keys, which appear to be an extension of the mainland. South of Lake Okeechobee the Big Cypress Swamp and the Everglades extend over a large part of the peninsula. These swamps are now being drained and transformed into fertile farms. The western coast contains several deep indentations in which good harbors are found, but the eastern shore is much more regular.

The principal rivers are the Saint Mary's, forming a part of the boundary between Florida and Georgia; the Saint John's, flowing into the Atlantic; the Caloosahatchee, draining Lake Okechobee into the Gulf; the Peace, flowing into Charlotte Harbor; the Suwanee, famous in song, crossing the state from the north, and the Apalachicola, which is an extension of the Chattahoochee and Flint rivers of Georgia. The state contains over 30,000 lakes, the largest of which is Okeechobee, which has an area of 650 square miles. This is situated on the northern border of the Everglades.

Climate. Except in the swamp region the state possesses one of the most equable and healthful climates in the United States. It is free from extremes, the winter temperature seldom falling below 32° and the summer temperature rarely exceeding 90°. The average annual winter temperature is 60°, the average summer temperature, 78°. There is little spring or autumn and such a brief winter that summer is said to last two-thirds of the year. June, July and August constitute the rainy season. There are, on an average, 250 clear days in the year. Droughts and frosts are rare. Jacksonville, Saint Augustine, Saint Petersburg, Miami, Key West, Palm Beach, Orlando and Tampa are winter resorts. The rainfall is fifty-five inches at

Jacksonville and over sixty inches in some places on the Gulf coast.

Mineral Resources. The minerals are comparatively few. The most important mineral is phosphate rock, which is found in almost every county and is exported to European countries for fertilizer. Florida is first among the states in the production of fuller's earth. In a few localities, agate, carnelian and chalcedony are found of sufficient quality to make them valuable as precious stones. The mineral products are worth about $10,000,000 a year.

Agriculture. Agriculture is the leading industry of Florida. For agricultural purposes the state may be considered in three divisions, Northern, Middle and Southern Florida. Northern Florida includes that part of the state extending south as far as Saint Augustine. It produces cereals, arrowroot, rice, potatoes, tobacco, apples, figs, peaches, pears and sea-island cotton. Middle Florida extends from the latitude of Saint Augustine to Tampa Bay. This region yields cotton, sugar cane, sweet potatoes, tobacco, rice, oranges, lemons, grapes, guavas, garden vegetables and small fruits. In Southern Florida are produced bananas, sugar cane, pineapples, olives and cocoanuts. The state produces four-fifths of the grapefruit grown in America and nearly all the pineapples. The cultivation and export of oranges is an important industry. Cotton, rice, sugar and tobacco are also valuable products. Grasses grow in abundance, and flowers bloom in luxuriance almost all the year round. The most valuable resource of Florida is its forests, estimated to cover 25,000,000 acres and composed largely of pitch pine and different species of evergreen oaks.

The chief crop, in value, is corn; the second, tobacco, followed in order by sweet potatoes, potatoes, oats, hay and cotton. In 1918 a great corporation was organized to grow sisal (which see) in the southern part of the state, on a 25,000 acre tract.

Other Industries. The principal manufactures are lumber and forest products, tar, turpentine and resin. Large areas are covered with groves of long-leaved pine, and the lumber from this is exported to other states and to foreign countries. Pensacola and Jacksonville are the chief cities of lumber export. Exceeding lumber in importance is the manufacture of cigars, which industry has its center at Tampa. The manufacturer uses tobacco raised in Florida and great quantities imported from Cuba.

The coasts and streams contain an abundance of food fish and shellfish, and the taking of shad, mullet and other fish is an important industry. Tarpon fishing is one of the favorite sports of winter visitors on the Gulf coast. Oyster culture has also been established in some localities, and there are extensive sponge fisheries in and about the islands. In all, the fisheries furnish employment to over 9,500 men, and the value of their annual product is $3,400,000.

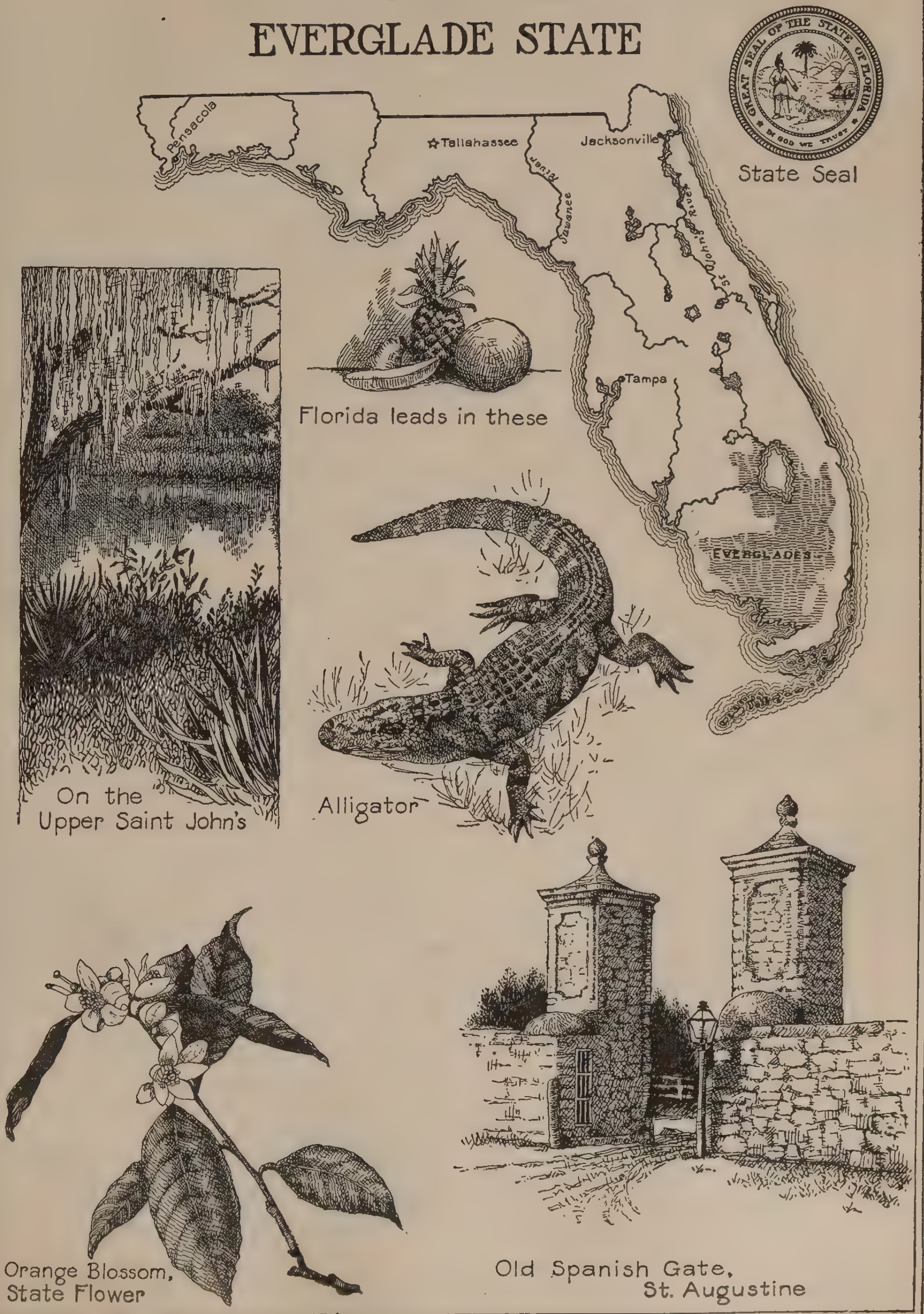
Transportation and Commerce. The extensive coast line affords good harbors, especially on the gulf coast. The Saint John's, Saint Mary's, Suwanee and Apalachicola rivers are all navigable for large boats, and a number of other streams are navigable for smaller ones. The railways have been rapidly extended through the state, and trunk lines connect all of the important cities with one another and with the principal commercial centers farther north. The railway mileage of the state is about 5,300; the Atlantic Coast Lines, the Florida & East Coast Railway, the Seaboard Air Line and the Louisville & Nashville are the principal lines (see KEY WEST).

Government. The legislature consists of a senate and an assembly, the former composed of thirty-two members, chosen for four years, and the latter of seventy-five members, chosen for two years. The legislative sessions are held every other year and are limited to sixty days. The governor is elected for four years and is not eligible to succeed himself. The other state officers are the attorney-general, secretary of state, comptroller, commissioner of agriculture, treasurer and superintendent of public instruction. The courts consist of a supreme court, comprising a chief justice and four associates, chosen for six years; also circuit, criminal and county courts and those of justices of the peace.

Education. The higher institutions of learning are the University of Florida at Gainesville, the Florida State College for Women at Tallahassee, the John B. Stetson University at Deland, Rollins College at Winter Park, Columbia College at Lake City, Palmer College at De Funkiah Springs and Southern College at Sutherland, all for white students. There are four schools for the higher education of negroes. Numerous col-

FLORIDA

EVERGLADE STATE



State Seal

Florida leads in these

On the Upper Saint John's

Alligator

Orange Blossom, State Flower

Old Spanish Gate, St. Augustine

Items of Interest on Florida

The western coast line is less regular than the eastern, being indented by a number of bays and harbors, the largest of which are Charlotte Harbor, Tampa Bay and Pensacola Bay.

The forests cover about sixty per cent of the total land area: yellow pine in the north and cypress in the south and coast regions are predominant, but nearly half the varieties of forest trees in the United States are common.

The lumber industry is second only to the manufacture of tobacco: the total products of lumber and timber are valued at nearly $21,000,000 annually.

The Florida fisheries rank fifth among the states of the Union.

The state has almost a monopoly of sponge fisheries, whose products are worth nearly $600,000 a year; it contributed two-thirds of the value of the mullet catch, and is surpassed in the value of its shad catch only by Virginia and North Carolina.

In the manufacture of turpentine and rosin it leads all states, its product being nearly one-half that of the United States.

Questions on Florida

How does the coast line of Florida compare in length with that of other states?

Describe the surface of the state. Where is the dividing line for river drainage? Name the principal rivers.

What can you say of the number and peculiarities of the lakes in the central part?

What are the "Everglades"?

As regards climate how may Florida be divided?

Of what fisheries product has Florida a monopoly?

What are the principal crops?

Name the three great manufacturing industries in the state.

Which is the oldest city in the United States? Is there any other reason for its importance to-day?

leges and secondary schools are maintained by various church denominations.

The state institution for the blind and dumb is located at Saint Augustine and the state reformatory is at Marianna. There is a hospital for the insane at Chattahoochee, and a home for the Confederate soldiers and sailors at Jacksonville. The state prison farm is at Raiford.

History. Florida was discovered on Easter Sunday (Spanish, *Pascua Florida,* hence its name) in 1512, by Ponce de Leon, a Spanish adventurer in search of the fountain of perpetual youth. Naryaez and De Soto both traversed the country. Huguenot refugees twice attempted settlement on the Saint John's River; the second time the colonists were massacred by Spaniards under Menendez, who founded Saint Augustine. In 1699 the Spaniards founded Pensacola. East and West Florida (separated by the Apalachicola River) came under the control of the English by the treaty of 1763; were ceded to Spain in 1783 and transferred to the United States in 1819, after a long controversy, due to the fact that Florida was a haven for pirates and thieves and a refuge for fleeing slaves, while Spain took no steps to preserve order.

On March 3, 1845, Florida was admitted to the Union as the twenty-seventh state. From 1835 to 1842 war was waged with the Seminoles, and as a result they were given lands west of the Mississippi. In 1861 the state seceded from the Union and seized Fort Marion, the arsenal at Saint Augustine, the arsenal at Chattahoochee and the navy yards and forts at Pensacola. In 1862 Jacksonville, Fernandina and Saint Augustine were captured by the Federal forces. In 1865 the ordinance of secession was repealed, and in 1868 a new constitution was framed, the Fourteenth Amendment was ratified and the state was readmitted to the union. From this time on the chief points of interest in Florida history concerned the bitter political contests for control of the state and the settlement of financial difficulties by the government. The state played an important part in the election controversy of 1876. In 1916 the state legislature proposed a grandfather's clause as an amendment to the constitution, but the people defeated the measure. Widows who have dependent families are exempt from taxation if their property is worth not more than $500. On January

1, 1919, a stringent prohibition law became effective.

Related Articles. Consult the following titles for additional information:

Apalachicola River
Dry Tortugas
Everglades
Electoral Commission
Florida Keys
Grandfather's Clause
Jacksonville
Key West
Mexico, Gulf of
Palm Beach
Pensacola
Saint Augustine
Saint Petersburg
Tallahassee
Tampa
Seminole

FLORIDA KEYS, a chain of islands, sand banks and reefs, which begin at Cape Florida and continue southwest for about 200 miles. There are a great many of these islands and most of them are of coral formation. One of the largest is Key West, or Bone Key, on which is built the city of Key West. On this key is an old Spanish fort, which is the southernmost building on United States soil. Along the Keys from the mainland to Key West runs a remarkable railroad (see KEY WEST).

FLO'RIN, from the Latin *florem,* meaning *flower,* is the name given to a gold coin which originated in Florence, Italy, in the thirteenth century. It was so called because one of its faces bore a floral design. Similar coins have since been used throughout Europe. The English florin is equal to two shillings, or about fifty cents. Until recently the florin was the monetary unit of Austria; there it is now called a *gulden,* and is worth about forty cents. The Dutch florin has the same value. See COINS, FOREIGN.

FLOTOW, *flo'to,* FRIEDRICH VON (1812–1883), a German composer of opera. After a brief musical education he began in 1830 to devote himself to composition. His *Le Naufrage de la Meduse* was successfully produced at the Renaissance Theater in 1839; this was soon followed by *L'Esclave de Camoens, Le Forestier* and *Alessandro Stradella.* His best opera, and the only one which is heard to-day, is *Martha;* this was first given a hearing at Vienna in 1847.

FLOUN'DER, one of the most common of the flat sea fishes, found along the shores of almost all countries. The body, which is extremely flattened at the sides, has the upper side dark and spotted and the under side white. Both eyes are on the upper side, and one is set lower than the other, giving the face a twisted appearance. The flounder is esteemed for its flesh.

FLOUNDER

FLOUR, in the common acceptance of the term, a finely ground preparation made from the best part of wheat. It is the basis of most of the bread used in the United States and Canada, and in many countries in the Old World. When merely the term *flour* is used wheat flour is generally meant. That made from any other cereal usually receives a qualifying term, as rye flour, rice flour, barley flour, etc.

Wheat owes its popularity as a flour grain to the fact that it contains a tenacious form of gluten, a substance which makes the dough of the bread tough and sticky. As a result, the bubbles of gas which form through the action of yeast are retained by the dough, and it becomes light and porous. Since no other cereal grain contains gluten of so tenacious a quality as that of wheat, flour from that grain is by far the most popular with the housewife who does her own baking. Wheat flour, too, ranks high in respect to nutriment, and most people prefer the white, tender bread made from it to other kinds.

After the United States entered the World War and it became necessary to send greater quantities of wheat to the allied nations, the government began a food conservation campaign which resulted in a much wider use of other flours, especially barley, rye, rice and corn. When part of all of these flours were mixed with white flour, in the proportion of four parts of wheat to one part of the others, a very palatable and nutritious bread was obtained. This was the standard recipe in use in the fall of 1918.

How Wheat Flour is Made. The manufacture of flour entails a series of operations. The kernels must first be cleaned of dirt, seeds, chaff, fuzz and hair, and this is done by passing them through several machines. After the cleansing process the wheat is passed through several sets of rollers, usually five in number, each passage being termed a *break.* From the first grinding come first-break flour, middlings, or bits of the inner part of the kernel and of the hard outer layers (bran), and unbroken wheat. The next series of rollers pass over the unbroken wheat left from the first break, and it, too, is separated into first-break flour, bran and middlings. The middlings from each operation are purified and separated from by-products such as bran, and finally are reduced by a series of grindings to high-grade flour.

Lower grades and special trade brands are made by mixing in various ways impure middlings or other by-products with different grades of flour. Unsifted wheat meal ground from the whole kernel is the Graham flour used so widely in making muffins. By whole-wheat flour is meant the meal obtained by grinding all of the kernel except the coarser portions of the bran.

Related Articles. Consult the following titles for additional information:

Barley
Bran
Bread
Corn
Gluten
Rice
Rye
Starch
Wheat

FLOWERS. The poet says that flowers were put into the world—

> To minister delight to man
> To beautify the earth.

So the student thinks of them until he begins to study botany; he then learns that they are modified branches, or shoots, designed for the production of seeds.

How Flowers are Constructed. In a typical flower there are four circles, or parts. The first, or outermost, is the *calyx,* which is often leaflike and in the form of a cup. It is divided into separate parts, known as *sepals.* The function of the calyx is the protection of the more delicate parts within. The next circle within is the *corolla,* whose parts are called *petals.* The corolla is usually bright-colored, and its design seems to be to attract insects or birds and, also, to protect still further the *stamens* and *pistils,* that form the third and fourth circles. Each of the stamens is composed of two parts, a stem, called the *filament,* and a sack at the top, called the *anther.* The innermost organs are called pistils and consist of, first, an enlarged chamber, called the *ovary,* containing *ovules;* a stem, called the *style,* and a tube, called the *stigma.* Within the stamens is ripened the *pollen,* which must be carried to the pistils, in order to fertilize the ovules, which thereafter become seeds.

How Flowers Vary. Few flowers are altogether typical. Often, not all of the four circles are present. Either the calyx or the corolla or both may be lacking, or only stamens may be found in one flower, while the pistils are in another flower on the same plant. The flowers on one plant may all contain stamens only, while those of another plant contain pistils only. Then, the parts of each circle may be variously united in one solid ring or cup, or so grown together that it is impossible to distinguish one circle from the other. However numerous or remarkable these variations, it is almost always possible to distinguish some trace of the typical flower; that is, if there are five divisions in any one of the circles, traces will be found of a similar division in the other circles.

The typical flowers are comparatively uninteresting if one considers the wonderfully irregular blossoms of many plants. The meaning of these strange shapes has not yet been fully determined, but botanists who have made a painstaking study of the varied forms think that all have some definite reference to the way in which the pollen is carried from stamens to pistils. The one great fact in the life of the flower is that the pollen must be transported to the stamen, and it has been proved again and again that those plants grow strongest and best which are from seeds fertilized by pollen from a different flower on the same plant or from an entirely different plant. If one considers that the brilliancy of color, the varied and wonderful shapes, the honey-bearing sacks, the peculiar markings are all methods of attracting insects or birds, the astonishing irregularity becomes even more attractive than at first it seemed. In the accompanying plate are to be seen some of the most remarkable forms of flowers.

Artificial Flowers are imitations of flowers, which may be made of various materials. Such flowers were known centuries before the beginning of the Christian Era; flowers made of papyrus bark and silk were common in Greece, and in both Greece and Rome there were in use wreaths of flowers made of gold and silver. During the Middle Ages artificial flowers were made in great numbers, especially in Spain and Italy, and were used for religious purposes. Among modern cities Paris takes the lead in the making of artificial flowers. The most common materials used in this industry are silks, linen, cotton, gauze, satin, velvet, wax,

paper and glass. The stems are made of wire, wrapped with tissue paper or silk or covered with green rubber tubing.

Artificial flowers are used in the United States and England chiefly as trimming for ladies' headwear, but in Europe they are still in use for garlands and in house decorations. Another important use to which they are put is to illustrate the flora of the world in botanical laboratories. Of course the manufacture of flowers which are to be used for this purpose is a much more delicate task than that of flowers which are used merely for ornament, and the maker must have considerable botanical knowledge. There is at Harvard University a collection of flowers made of glass, which illustrate the flora of the United States.

Language of Flowers. Long ago, in the Orient, the custom originated of expressing one's thoughts and feelings by means of flowers. To some extent the custom still survives, though in the practical New World it is of little interest. Strangely enough, the language is almost universal, varying in different countries only in regard to certain flowers which are locally significant. Still, as in the olden times, the lily denotes innocence; the forget-me-not, friendship; the red rose, I love you, and the white rose, I will wed you. The following are flowers whose significance is well established:

Amaranth	Immortality
Anemone	Anticipation
Apple Blossom	Admiration
Aspen Leaf	Fear
Brier	Insult
Buttercup	Wealth
Camellia	Illness
Calla	Pride
Candytuft	Indifference
Cornflower	Heaven
Cowslip	Youthful beauty
Cypress	Death
Daffodil	Unrequited love
Daisy	Simplicity
Dandelion	Coquetry
Evergreen	Hope
Everlastings	Undying affection
Fern	Forsaken
Five-leafed Clover	Bad luck
Four-leafed Clover	Good luck
Foxglove	Insincerity
Goldenrod	Encouragement
Heather	Loneliness
Heliotrope	Devotion
Hepatica	Anger
Honeysuckle	Fidelity
Hyacinth	Sorrow
Ivy	Trustfulness
Laurel	Fame
Lilac	Fastidiousness
Lotus	Forgetfulness
Marigold	Contempt
Moss or a dry twig	Old age
Myrtle	Wedded bliss
Narcissus	Vanity
Oak Leaf	Power
Orange Blossom	Marriage
Oxalis	Pangs of regret
Palm Leaf	Conquest
Pansy	Loving thoughts
Poppy	A tryst at evening
Rosemary	Remembrance
Rue	Repentance
Scarlet Geranium	A kiss
Snowdrop	A friend in need
Sting Nettle	Rudeness
Tuberose	Bereavement
Tulip	Boldness
Violet	Modesty
Yellow Rose	Jealousy

National and State Flowers. In some countries a flower has been legally adopted as national emblem, but in a majority of cases, by its association with the poetry, religious ceremonies or popular sentiment of the people it has gradually become universally recognized as the nation's symbol. The following list shows the generally accepted national flowers:

Canada	Maple Leaf
China	Narcissus
Egypt	Lotus
England	Rose
France	Fleur-de-lis
Germany	Cornflower
Greece	Violet
India	Lotus
Ireland	Shamrock
Italy	White Lily
Japan	Chrysanthemum
Mexico	Nopal Cactus, or Prickly Pear
Persia	Rose
Scotland	Thistle
Spain	Pomegranate
Switzerland	Edelweiss
United States	Goldenrod
Wales	Leek

In the United States, in 1899, by a popular vote, the goldenrod was selected as the national flower. A number of states have adopted, usually by vote of the public school children, certain local flowers as their emblems. The following is a list of these states:

Alabama	Goldenrod
Alaska	Forget-Me-Not
Arizona	Saguaro (Giant Cactus)
Arkansas	Apple Blossom
California	Golden Poppy
Colorado	White and Blue Columbine
Connecticut	Mountain Laurel
Delaware	Peach Blossom
District of Columbia	Nasturtium
Florida	Orange Blossom

Wonder Questions on Flowering Plants

Why do plants bear flowers?

All of the earth's flowering plants, and they constitute by far the majority of plants, produce flowers for the purpose of reproducing other plants. According to the botanist, the purpose of flowers is to bear seeds, and of seeds to make new plants. When we remember, however, the happiness that flowers bring to human kind, and how much they contribute to the world's beauty, we are inclined to believe that they were created also to increase our joy in life.

Is there a special reason for the bright colors, peculiar forms and pronounced odor of flowers?

This question opens up one of the most interesting fields in flower study. We must bear in mind that flowering plants multiply through the transference of pollen from one flower to another, and that birds and insects play a very important part in this work. They visit the flowers for pollen and nectar, and as they fly from blossom to blossom they carry with them the fertilizing grains. It is interesting to know that conspicuous colors and odors serve as a lure for these industrious pollen carriers, and that many curious shapes and markings are for the same purpose. Some flowers, like the roses and buttercups, attract all sorts of insect visitors; others are so shaped that only certain kinds can reach their pollen or nectar. The honeysuckle and trumpet flower allure the humming birds, and the violets are visited by bees, but not by smaller insects. A careful study of flowering plants shows the wonderful way in which nature has adapted the flowers to the needs of insects and birds, so that they, in turn, may help the plants carry on their life processes.

Do plants have the power of movement?

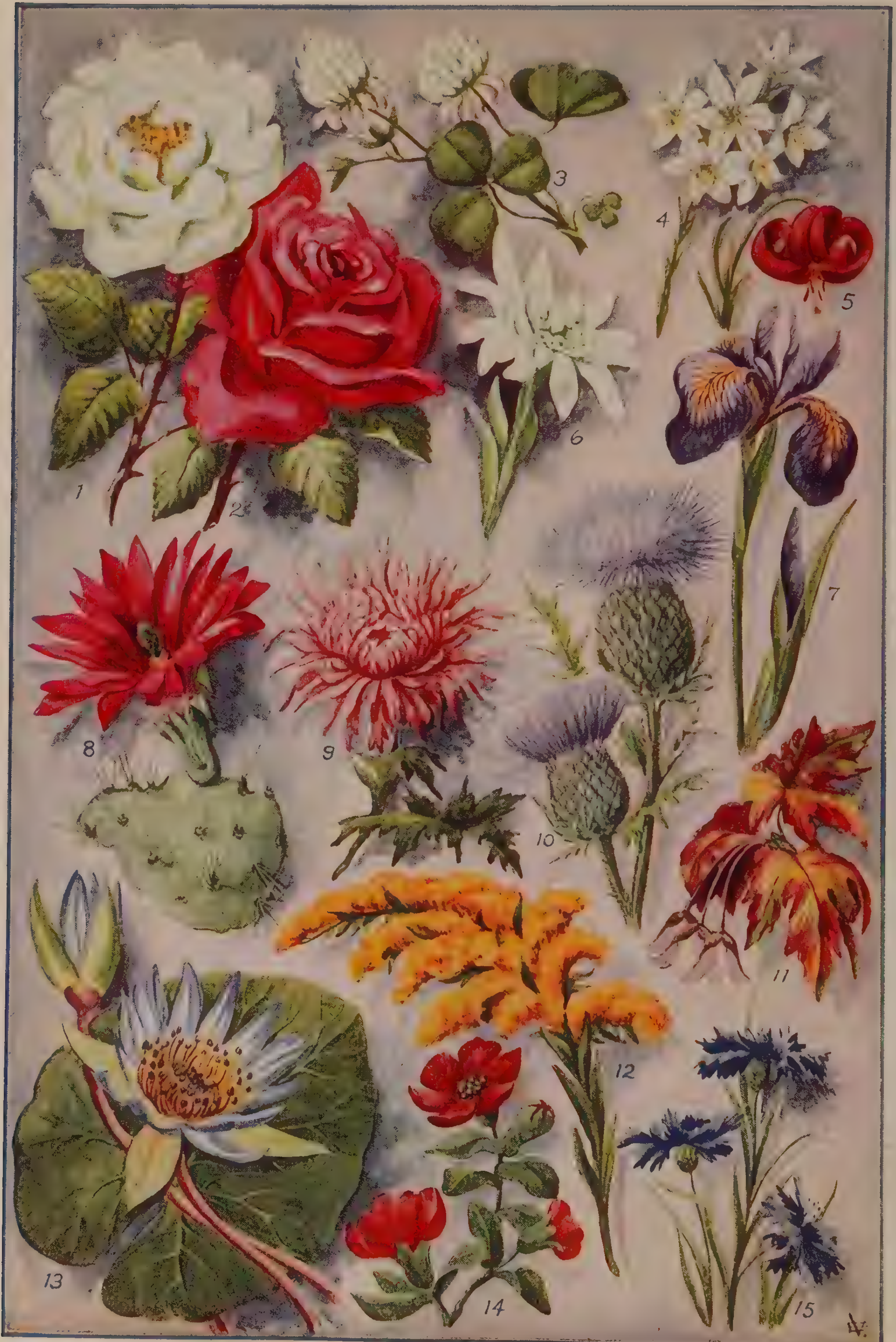
Of course we would never expect to see the rosebush in our garden get up and walk away like the dog lying beside it, but many plants have power to move in other ways. That is, they can move such parts as the flowers and leaves. The blossoms of the morning glory, for instance, close after the sun gets bright in the sky, and do not open until the next morning. The stamens of the barberry flower spring up when touched, and the leaflets of the sensitive plant fold over each other when the plant is shaken. The compound leaves of many plants have the power of changing the position of their leaflets according to changes of light and temperature. For example, the leaflets will be edgewise toward the sun during the hottest hours of the day, and be expanded horizontally when the sun is low. Some leaves droop, or go to sleep at night, such as those of the wood sorrel and acacia. So we see that various parts of a plant may change position, even though the plant itself is stationary. The familiar statement that an animal differs from a plant in its power of movement should be amended. It is more correct to say that most animals are more active than most plants.

Do flowers eat?

The life of a flower depends upon the nourishment the whole plant receives. We know that plants receive food from the soil, absorbing it through their roots; yet there are some interesting plants that capture insects and other small animals and digest them. If you are familiar with the sundew you will remember that at the base of the flower stalk there is a circle of roundish leaves bearing bristles. Each of these bristles ends in a knob covered with a sticky liquid. When a small insect lights on one of these knobs and cannot get away, the bristles begin to close over it, and it is soon a prisoner. Then the leaf pours out a juice that digests the soft parts of the insect, and the plant reabsorbs the liquid. This is the way one plant helps feed its flower. Then there is the interesting pitcher plant. whose leaves resemble a hooded pitcher. Most of the time the leaves are partly full of water, in which insects crawl and drown. The leaves of the Venus's flytrap, another curious plant, are in truth a trap for unwary insects, for they end in a hinged portion that opens and closes quickly upon unlucky visitors. Plants of this character, which feed on animal food, are called carnivorous plants.

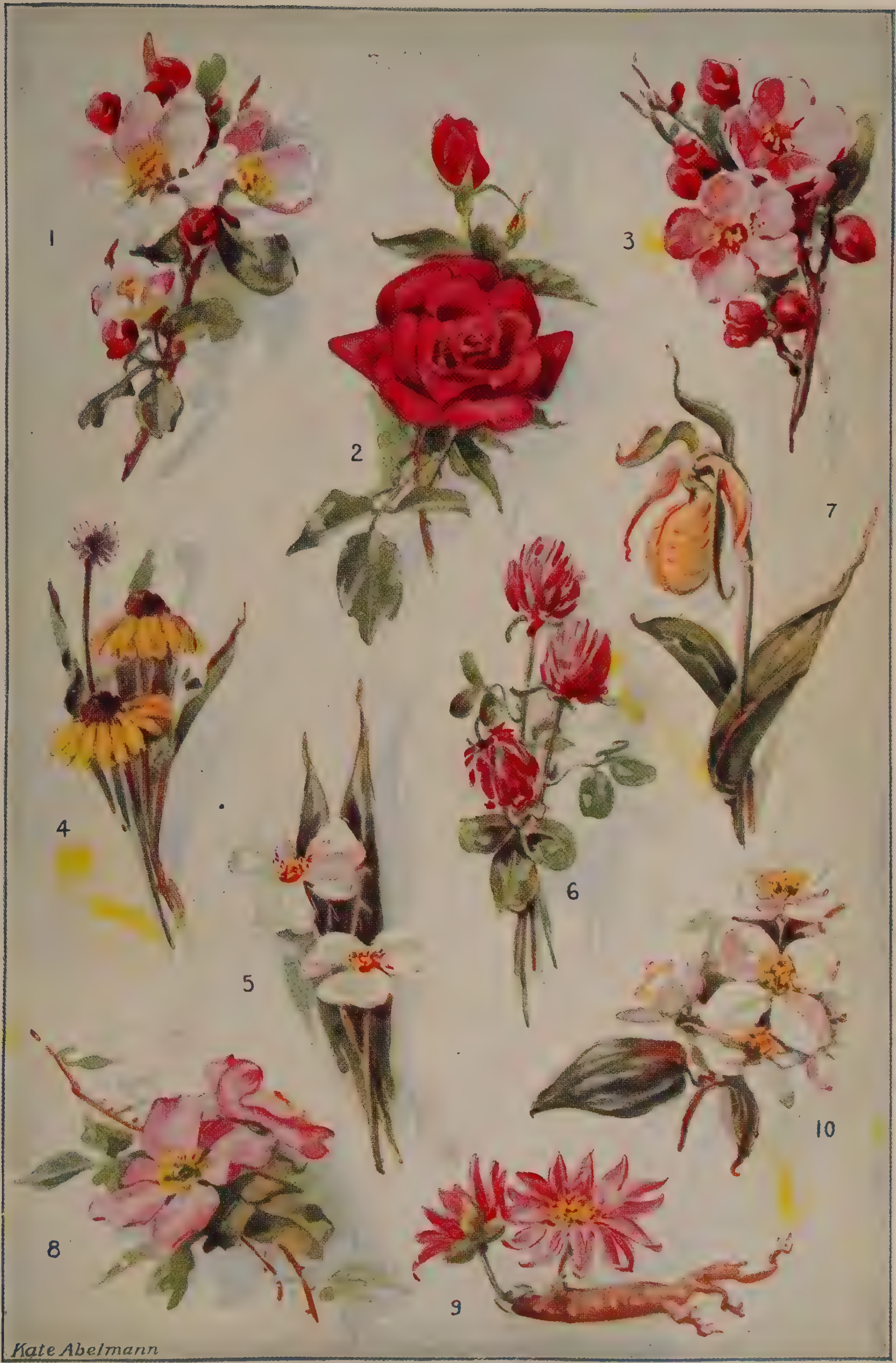
Do flowers have souls?

The lover of flowers likes to think so, and much of the poetry about flowers suggests that they have souls. Someone has said, "The odors of flowers are their souls." But though plants respond so wonderfully to the care lavished upon them, they never talk to us in the sense that animals do, and the idea that they have souls is purely one of sentiment. The absence in plants of the thing we call mind or soul is an important point of distinction between the plant and the animal world. The higher animals possess an intricate nervous system with a brain center, but the most elaborate of culti-



NATIONAL FLOWERS

1 and 2, Roses: England and Persia.
3, Shamrock: Ireland.
4 and 5, Lilies: Italy.
6, Edelweiss: Switzerland.
7, Fleur-de-lis: France.
8, Cactus: Mexico.
9, Chrysanthemum: Japan.
10, Thistle: Scotland.
11, Sugar Maple: Canada.
12, Golden-Rod: United States.
13, Lotus: Egypt and India.
14, Pomegranate: Spain.
15, Kaiser-Blume: Germany.



STATE FLOWERS

1, Apple Blossom: Arkansas, Michigan.
2, Rose: New York.
3, Peach Blossom: Delaware.
4, Black-eyed Susan: Maryland.
5, Sego Lily: Utah.
6, Red Clover: Vermont.
7, Moccasin Flower: Minnesota.
8, Wild Rose: Iowa, North Dakota.
9, Bitter Root: Montana.
10, Syringa: Idaho.

vated plants has nothing to correspond to a brain. Flowers therefore can be plucked without feeling pain, and they know nothing of fear, joy, sorrow or disappointment. It is the imaginative and sentimental in mankind that endows them with intelligence.

What gives the flowers their different colors?

Within the tiny seed, the nucleus of the plant, are produced certain ferments that determine the colors of the flowers. Just how this is accomplished no man can explain, any more than he can explain how the seed expands into a plant. We know, however, that leaves are green because they contain a green coloring matter called chlorophyll. The purpose of this substance is to help the plant manufacture starch. It is an interesting fact that no flowers are green. Some botanists explain this by saying that if the stem, leaves and flowers were all green insects would find it difficult to distinguish the flowers, which they visit to procure pollen and nectar.

Were the flowers all wild at one time?

Yes, all of our cultivated flowers are descendants of wild flowers. Many of the varieties that are now fairly common did not at one time exist, and the art of floriculture is constantly expanding. By scientific methods of breeding, men are able to produce new forms of nearly all flowers.

Do all trees bear flowers?

Yes, trees are important members of the great class of plants that produce flowers and seeds. Not all trees, however, bear flowers of size and prominence. In fact, the beauty of a great many trees depends chiefly upon their foliage, and most people never see their flowers. This is because the blooms of such trees have no petals, the most noticeable parts of the typical flower. But many fruit trees, such as the apple and cherry, have blossoms everywhere known for their loveliness and fragrance. This reminds us that flowers are produced in a wide variety of forms. A typical, or perfect, flower has four circles or sections—calyx, corolla, stamens and pistils—but very few flowers have all of these parts.

In what ways do flowering plants help mankind?

These plants help us in a great many ways. First of all, they make breathing easier for us. They use up a great deal of carbon dioxide, which we breathe out as waste matter, and they send into the air oxygen, without which no one can live. Plants add to our comfort by providing shade in the summer, and they also prevent water which falls as rain or dew from too rapid evaporation. Forests help to regulate rainfall and to conserve moisture. From flowering plants we get the greater portion of the food that sustains life. Fruits, vegetables and cereals are all products of flowering plants. Our favorite beverages, tea, coffee, cocoa and chocolates, are derived from plants. All of the spices that we use to flavor our foods come from plant sources. Moreover, our clothing is partly of plant origin, for linen and cotton are fabrics woven of plant fibers. Then there are the trees, which provide mankind with wood for houses, ships and furniture. In fact, man could not exist without the wonderful plant kingdom.

Do all flowering plants of a certain kind belong to the same family?

There is always some definite connection between the plants of one family, but many curious relationships may occur. For example, the lovely Easter lily, the lily of the valley, the tulip, the hyacinth and the trillium belong to one family (the lily), but this same family contains also the ill-smelling onion and the unromantic asparagus. The rose family contains not only the loveliest flowers ever grown, but also the most delicious fruit plants—the apple, peach, pear, strawberry and others. But the cranberry and huckleberry belong to the heath family. Perhaps the strangest family is the nightshade, to which belong many useful plants, as the potato and tomato, and also many poisonous ones and a number of annoying weeds. Botanists group different plants together according to similarities of structure, not according to their degree of attractiveness.

Why is the dandelion considered a weed and the rose a welcome flower?

The term "weed" is applied to any flower when it multiplies so rapidly that it makes a nuisance of itself. Most people think a lawn is spoiled if the hardy dandelion gets hold in it, and that cheery little flower is anything but welcome. Dandelions need no encouragement. All they ask is to be let alone and they will grow abundantly. But the rose, the queen of the garden, needs the tenderest care and much coaxing. No one can imagine a mass of American Beauties, for instance, running riot over a lawn. A number of the attractive flowering plants that give color and charm to the country landscape are nothing but weeds to the farmer.

Georgia	Cherokee Rose
Idaho	Syringa
Illinois	Violet
Indiana	Carnation
Iowa	Goldenrod
Kansas	Sunflower
Kentucky	Trumpet Vine
Louisiana	Magnolia
Maine	Pine Cone and Tassel
Maryland	Black-Eyed Susan
Michigan	Apple Blossom
Minnesota	Moccasin
Mississippi	Magnolia
Missouri	Goldenrod
Montana	Bitterroot
Nebraska	Goldenrod
Nevada	Sagebrush Shrub
New Jersey	Sugar maple (tree)
New Mexico	Cactus
New York	Rose
North Dakota	Wild Rose
Ohio	Scarlet Carnation
Oklahoma	Mistletoe
Oregon	Oregon Grape
Rhode Island	Violet
South Dakota	Anemone
Texas	Blue-bonnet
Utah	Sego Lily
Vermont	Red Clover
Washington	Rhododendron
West Virginia	Rhododendron
Wisconsin	Violet
Wyoming	Gentian

Related Articles. Consult the following titles for additional information:

NAMES OF FLOWERS

Acanthus
Adonis
Agrimony
Amaranth
American Beauty
Anemone
Arbutus
Asphodel
Aster
Azalea
Bachelor's Buttons
Begonia
Belladonna
Bignonia Lily
Bitterroot
Black-eyed Susan
Bleeding Heart
Bluebell
Buttercup
Calla
Camellia
Campanula
Candytuft
Cardinal Flower
Carnation
Christmas Rose
Chrysanthemum
Clematis
Columbine
Cowslip
Crocus
Cyclamen
Dahlia
Daisy
Dandelion
Dog's-tooth Violet
Easter Lily
Everlasting Flower
Fleur-de-lis
Forget-me-not
Foxglove
Fuchsia
Gardenia
Gentian
Hollyhock
Honeysuckle
Hyacinth
Hydrangea
Immortelle
Iris
Jack-in-the-Pulpit
Jasmine
Jonquil
Lady's Slipper
Larkspur
Lilac
Lily
Lily of the Valley
Lobelia
Lotus
Marigold
May Apple
Mignonette
Moccasin Flower
Moonflower
Morning-glory
Narcissus
Nasturtium
Nelumbo
Oleander
Orchid
Passion Flower
Peony
Petunia
Phlox
Pink
Poppy
Primrose
Pyxie
Rhododendron
Rose
Snowdrop
Sunflower
Sweet Alyssum
Sweet Pea
Sweet William
Tiger Lily
Trillium
Geranium
Gladiolus
Gloxinia
Goldenrod
Harebell
Heliotrope
Hepatica
Hibiscus
Trumpet Flower
Tuberose
Tulip
Verbena
Violet
Wallflower
Water Lily
Wistaria
Zinnia

GENERAL TOPICS

Attar
Botany
Bud
Bulb
Catkin
Composite Family
Cross Fertilization
Exotic
Gardening
Greenhouse
Nature Study
Perfume
Plant
Pollen
Seeds

FLOYD, John Buchanan (1807–1863), an American statesman and soldier, born at Blacksburg, Va., educated at the College of South Carolina. He was admitted to the bar and practiced his profession at Helena, Ark., but returned to Virginia in 1839. He later served in the legislature and was governor of the state. In 1857 he was appointed secretary of war and constantly administered favors to the party then demanding the secession of the Southern states, until December, 1860, when he retired from the cabinet at the request of the President. He was a brigadier-general in the Confederate army and was senior in command at Fort Donelson before its surrender. See Fort Henry and Fort Donelson.

FLUID. A solid has rigidity, or elasticity of form; its form can be altered by applying pressure; but a fluid has no form unless it is supported by a containing vessel, or, to be more exact it conforms to the shape of any vessel in which it is placed. Fluids are divided into liquids and gases by means of two distinguishing properties:

First, a liquid, such as water, is but slightly compressible, while a gas offers relatively small resistance to a pressure seeking to reduce its volume. Water is reduced only .00005 of its volume by a pressure which will reduce air one-half of its volume.

Second, gases are distinguished from liquids by the fact that any mass of a gas in a closed vessel always completely fills it, whatever its volume. A liquid has bulk of its own, but a gas has not. The particles of a gas will always expand to the boundaries of its containing vessel.

Mechanics of Fluids. Perhaps you have never thought of fluids as exerting a pressure in all directions. Yet it is true. A board on top of water is evidence that there is pressure holding it up. We know water has weight and therefore exerts pressure downward. It is a fact, too, that there is pressure on the sides. The pressure of a fluid is always at right angles to any surface on which it acts. Furthermore, if we neglect the weight of the fluid, pressure is the same at all points in the mass of the fluid. If, therefore, we apply pressure to any area of an enclosed fluid, the pressure acts equally in every direction.

The pressure of a liquid on a body immersed in it is a vertical force upward; this upward pressure is called "buoyancy." For example, suspend a weight by a string from the hook of an ordinary spring balance and note the reading. Now submerge the weight in water. The weight will be less. The law of buoyancy is said to have been discovered by Archimedes about 240 B. C.; a body immersed in a liquid is buoyed up by a force equal to the weight of the liquid displaced by it. When a body is immersed in a fluid, it may displace a weight of fluid *less* than, *equal* to, or *greater* than its own weight. In the first case, the upward pressure will be less than the weight of the body and the body will sink. In the second case, the upward pressure will just equal the weight of the body, which will remain in the fluid whenever placed. In the third case, the upward pressure will exceed the weight of the body, which will then rise to the surface. (For rules applying to specific gravity, see GRAVITY, SPECIFIC.)

Few of us think of the air as having weight. When the wind blows we know there is force in it, but who of us has thought that the air at rest has pressure? Years of experiment have finally proved that the pressure of the air is 1033.3 grammes per square centimeter, or 14.7 pounds per square inch. One of the easiest methods of testing air pressure is by a barometer.

Related Articles. Consult the following titles for additional information:

Atmosphere
Barometer
Gas

FLUORESCENCE, *flu o res′ence,* a property of certain substances by virtue of which they modify and change the appearance of light rays passing through them. The name comes from the mineral fluor spar (which see), some varieties of which exhibit this property in a marked degree. The phenomenon was discovered by Sir David Brewster in 1833. He noticed that when a ray of sunlight was permitted to pass through a lens and thence into a solution of chlorophyl (the green coloring matter of plants), the path of the ray within the solution was marked by a red light. He tried the further experiment of admitting a beam of light from a lens to a solution of sulphate of quinine and found that the surface on which the beam fell became bright blue. From these and other experiments he discovered that the fluorescent substance absorbs a part of the light which falls upon it, and changes its wave length, thus altering the color. Among substances which are highly fluorescent are canary glass, paraffin oil and solutions made from the bark of the horse chestnut.

FLUORINE, *flu′or in,* the most active element known, belonging to the group known as halogens. It is a greenish-yellow gas, a little heavier than air, which attacks almost every substance with which it comes in contact. It is widely distributed. In combination with calcium it constitutes the mineral known as *fluor spar;* it also enters into the composition of the bones and teeth of animals. It combines readily with most other elements but not with oxygen, hence it will not burn in air. Isolated in a vessel it burns sulphur, carbon, phosphorus and hydrogen; also most metals, forming *fluorides.* Water at ordinary temperatures is decomposed by it, owing to the affinity of fluorine and hydrogen which together form hydrofluoric acid. Fluorine was first isolated in 1887.

FLU′OR SPAR, fluoride of calcium. It is of frequent occurence, in connection with beds of silver, tin, lead and cobalt ores. It is sometimes colorless and transparent, but more frequently it exhibits tints of yellow, green, blue and red. Fluor spar crystallizes in cubes. It is used as a flux in metallurgy and is a source of hydrofluoric acid, which is used for etching glass. Fluor spar is also known as *fluorite.* It is found in masses in scattered regions in Illinois, New York, Missouri and Colorado, in the United States; in the Lake Superior region of Canada, and in Norway, Switzerland and Saxony.

FLUTE, a wind instrument resembling a fife, but having more finger holes and from six to a dozen keys, thus giving it a compass of nearly three octaves. It is usually made of wood, and is about twenty-seven inches long. It is a very important instrument in an orchestra, and is often used for solo parts. A piccolo is a high, shrill flute; in the same class of instruments is also the flageolet.

Deadly assault upon childhood

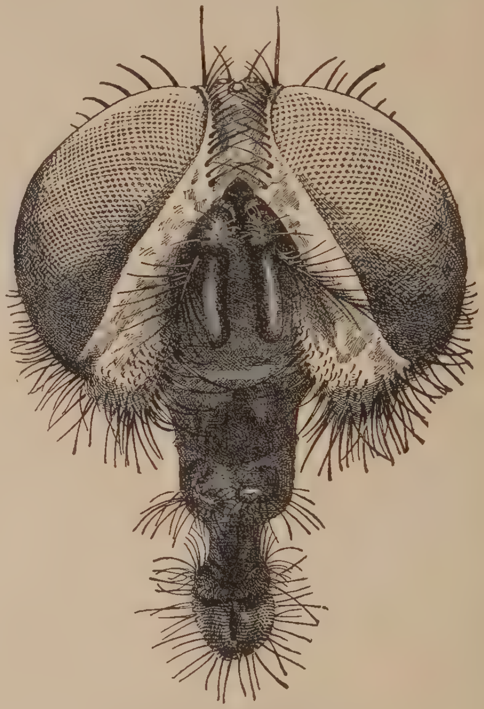
FLY. While this name is applied to about 14,000 insect species, it is the *domestic,* or *house,* fly that is meant when the term is used without a qualifying word. The distinguishing characteristic of the flies is the possession of two wings, which gives them the name *Diptera.* Outside of this order there is only one insect, a small scale insect, which has two wings. Mosquitoes, fleas, midges, gnats and blow flies are all members of the order Diptera, but the house fly is the most commonly known of that order and the one described in the paragraphs below.

Nothing shows more clearly the advance made in knowledge of sanitation than the present-day attitude of the public toward this fly. A generation ago the expression "as harmless as a fly" was one of the commonest forms of comparison, now the insect is recognized as deadly to human beings. To-day there is scarcely a person who has not heard or read about the fly crusade, and the insect has no defenders in civilized countries. Physicians, social workers and school teachers everywhere are preaching against it and urging its extermination because it is a carrier of disease and a direct menace to health.

The two wings of the fly are marked lengthwise with veins, and are transparent. Nearly all of the head consists of two compound eyes, with which the fly can see in all directions. As shown in the accompanying illustration, these eyes are equipped with thousands of facets. Everyone has noticed the ease with which the insect walks on a ceiling, upside down, or climbs up a smooth, vertical surface, like a mirror. This it does with the aid of suckerlike hairs on its feet.

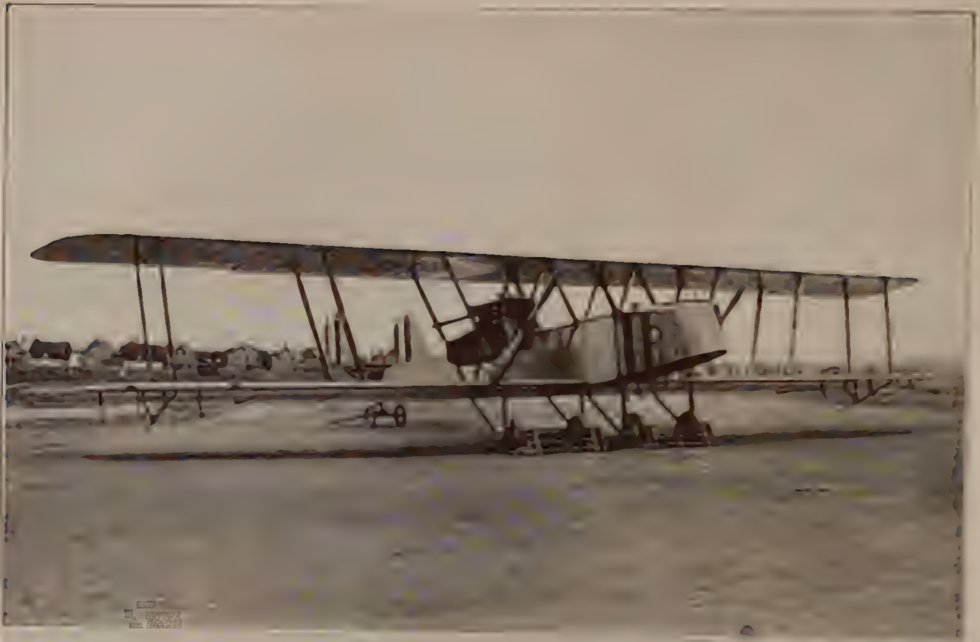
What is of greater importance is its ability to multiply. The female lays her eggs in rotting refuse or in the manure of a barnyard, and the larvae, which hatch in a few hours, are small white maggots, which change into pupae without casting their skins and in from eight to fourteen days become mature flies. As each fly lays more than one hundred eggs, and a new generation can be produced in ten days, it is evident that one fly in a single season may have billions of descendants. A few flies survive the winter in sheltered places and so preserve the species, though it is probable that many of the pupae live through the winter.

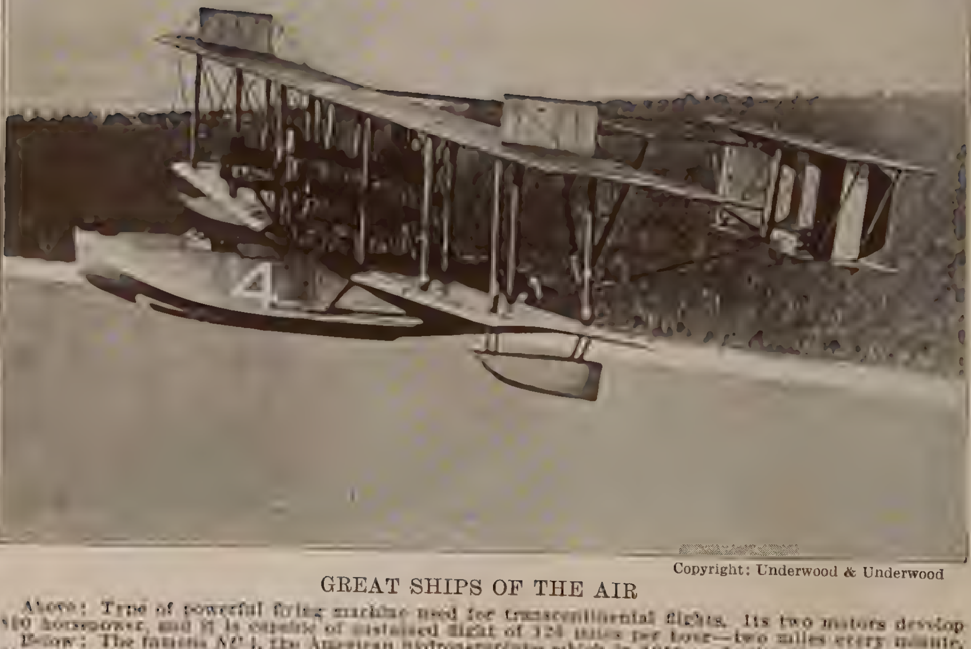
Flies are a source of contagion, because they carry disease germs from their filthy breeding places and haunts to the food used by human beings. They infect butter, milk, meat and any other food which they light upon, and in this way they cause the spread of typhoid fever, infant disorders, tuberculosis and other infections. It is said that one fly can carry on its body over 6,000,000 germs. There are certain methods of prevention and extermination which all communities can adopt. Every stray winter or early spring fly should be killed relentlessly. It is the survivors which are permitted to lay the eggs that maintain the fly population. Breeding places, such as garbage, heaps of refuse and any other accumulations of filth should be destroyed or buried, and backyards should be kept in a strictly sanitary condition. Screened windows and



HEAD OF HOUSE FLY

The two large areas studded with thousands of lenses are compound eyes. There are three simple eyes at the top center. The fly can therefore see in every direction. In the center opening are the feelers, or antennae.





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GREAT SHIPS OF THE AIR

Above: Type of powerful flying machine used for transcontinental flights. Its two motors develop 810 horsepower, and it is capable of sustained flight of 124 miles per hour—two miles every minute.

Below: The famous NC 4, the American hydroaeroplane which in 1919 made the first trans-Atlantic flight—from Newfoundland to Plymouth, England, via the Azores and Portugal. (The first non-stop flight was made by English aviators.) The photograph was taken in flight over the Mississippi River in 1920.

porches are helpful in keeping out the flies which persist in spite of precautions, and those which do slip into the house should be killed as soon as they are seen. Outside traps have been found useful. A simple one consists of a box of transparent material having in the bottom a crack not over a quarter of an inch wide. The crack should open up toward the bait, which may be any food flies like, such as sugar, molasses or banana peel. Many helpful suggestions on the war against the fly are to be found in pamphlets which the United States Department will furnish on request.

An outline for the study of the fly will be found in the article insects.

FLY'CATCHER, a family of songless birds embracing about four hundred species. The birds were so named because of their means of livelihood. However, they do not confine their diet to flies. Perched on a favorable lookout the bird watches, immovable and alert, for any passing insect it may devour. When it sees its prey it darts at it, seizes it with a snap of its bill and returns to its perch. As the birds feed chiefly on insects, few of them are seen in cold climates, or in winter in temperate regions; the phoebe is one of these winter residents. Of birds belonging to the family there are about thirty species in the United States and Canada. The wood pewee, crested flycatcher, kingbird and Acadian flycatcher belong to this family, but the Old World flycatchers and the tyrant birds belong to another group. Many of the tropical species have brilliant plumage.

FLY'ING DUTCH'MAN, in European legend, a phantom sea captain who sailed without rest upon the high seas. In life the captain swore during a violent storm that he would round the Cape of Good Hope if it took him until the Judgement Day. As punishment he was forced to sail the Southern seas forever. The legend has furnished the theme of an opera by Richard Wagner. According to his version the curse could be withdrawn if the captain could find someone who, knowing his fate, would consent to marry him. The story is one of the most tragic and beautiful in all opera.

FLY'ING FISH, a name common to various fishes which have the power of keeping themselves up for a time in the air by means of their large fins. It is not correct, however, to say that they fly. To escape from the attacks of other fishes, especially the dolphin and the mackerel, they often pass through the air to a considerable distance, sometimes as far as two hundred yards. Among the best known species is that of the North Atlantic, also found near the Hawaiian Islands; also the *great flying fish,* measuring eighteen inches in length, found around California, and the *sharp-nosed flying fish,* found in Central American waters.

FLYING MACHINE, the newest of the superlatively-great inventions in transportation, and one of the most marvelous developments of man in any age. It is known variously as a flying machine, airship and aeroplane, and excepting the dirigibles, it differs from its forerunner, the balloon, in being heavier than air. From a dangerous experiment, worthy the adventure of only the foolhardy, in the estimation of the average man, the airship has been made stable and dependable; instead of being a plaything it has become one of the world's necessities; in the hands of a skilled pilot it is made to outdistance with ease and leave far behind in a contest of speed the fastest locomotive or the most powerful automobile.

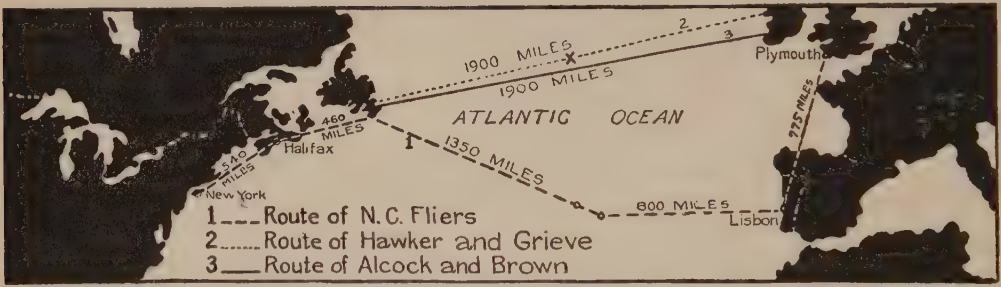
The first crude machine was built by Samuel Langley (which see), and men called it "Langley's folly.") Had Langley lived longer he might have confounded his critics. The final success of the heavier-than-air machine was due to the faith and tireless energy of Orville and Wilbur Wright, of Dayton, O., who persisted in their efforts unmindful of the ridicule of family and friends and even of learned scientists.

The airship has been developed, too, within a period of a very few years. In 1903 Langley was working out his "foolish dreams" with a heavy heart because of public indifference and ridicule. His first machine proved the clearness of his vision, however, when in 1914 Glenn H. Curtiss made a successful flight in the identical machine with which Langley had failed.

The Wright brothers were working on their plans at the same time that Langley was experimenting, and in 1903 they made a secret flight of 852 feet in their new machine on barren North Carolina sands. Then for over four years they perfected their device and secured patents, in the meantime making a machine that flew twenty-five miles. In 1908 they challenged the attention of the world with an airship that gave promise of ultimate safety.

Meanwhile, in France Santos-Dumont, in 1906, flew 655 feet and Farman, in 1907, flew 2,530 feet, in French machines; they followed the ideas developed in 1890 by Clément Ader, who in a small device traversed 100 feet, in what should properly be called a long jump.

From the year 1908 the flying machine was acknowledged to be a wonderful possibility, when fully developed. It was thought that many years would be required to bring to perfection needed devices to increase speed and insure safety. The World War in 1914 proved to be the incentive mechanical genius needed to make it speedily a perfect device.



FIRST FLIGHTS ACROSS THE ATLANTIC OCEAN

The cross marks the approximate spot where the airplane of Hawker and Grieve fell into the water.

When the war began airships flew at a speed of eighty to ninety miles an hour and carried one person. In 1916 the French army would accept no machine for air use over the enemy until it had developed 130 miles an hour in flight, burdened with two men and 900 rounds of ammunition for two machine guns and equipment. In 1918 a speed of 150 miles an hour was demanded and secured; such flight was accomplished with machines larger and heavier than ever before and burdened with four men, three guns and 3,000 pounds of ammunition and bombs. There was great significance in this realization of a powerful machine capable of maintaining sustained flight and carrying heavy loads. Before warfare ended in November, 1918, the British had perfected a monster machine which was capable of flying with a load of 30,000 pounds. It was designed for use in bombarding Berlin.

Trans-Atlantic Flights. In May and June, 1919, intrepid airmen accomplished "the most stupendous feat of the ages" and rendered commonplace the fabulous stories of Greek mythology by successful flights across the Atlantic. Three giant American planes left New York for England *via* Newfoundland, the Azores and Portugal. One of them, the *NC–4*, carrying a crew of six men in charge of Lieutenant-Commander A. C. Read, reached Plymouth (see map) on May 27. The two other crews only reached the Azores. Attempting to outstrip the Americans, Harry Hawker, an Australian, and Commander Grieve, an Englishman, started on a direct, nonstop trip from Newfoundland to Ireland, but met with disaster in midocean and were rescued by a freighter. British airmen won the first nonstop flight when Captain John Alcock and Lieutenant Arthur Brown on June 15, flew from Newfoundland to Ireland with comparative ease. Their flying time was sixteen hours twelve minutes; their average speed was almost 120 miles per hour.

The Two Models. All flying machines of the heavier-than-air variety thus far constructed are built with one wing, or plane, on each side of the body, or with two wings on each side. The former are appropriately called *monoplanes;* the latter, *biplanes.* The machines of the Wright brothers and of Glenn H. Curtiss are of the latter type, while some of the successful French makes are of the former.

The Biplane. The Wright machines of the period preceding the World War were equipped with two planes, each extending about twenty feet from each side of the body; they were about six feet wide, and one was placed six feet above the other. Large machines to-day have a wing spread of nearly 150 feet. The planes are connected by uprights, which are so joined to the planes and braced as to form a light, strong frame. The covering for the planes is strong linen; cotton was tried, but was found too weak for severe stress of air pressure. The woodwork is of spruce; metal parts are of steel.

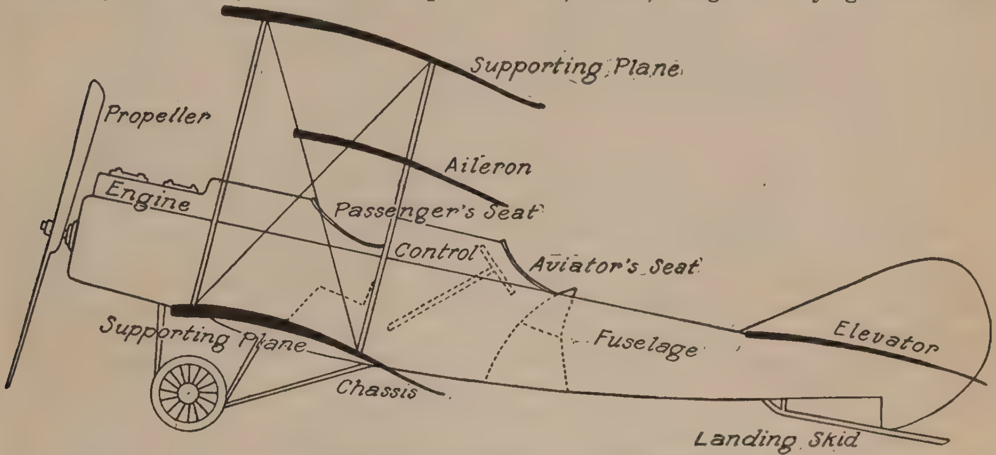
The most intricate machinery fills the forward body of the car, in front of the pilot. In large planes designed for war uses two sets of controls are provided—one for the pilot and another for the observer; in the event that one is killed or wounded his companion is not left helpless in the air. There are horizontal and perpendicular rudders, responsive to the slightest movement of the controls.

The first Wright biplane had an engine of 3½ horse power; in 1918 the great battle planes had two 200-horse-power engines. Control and power had been so perfected by that year that the American DeHaviland engines of 400 horse power could carry a machine from a ground start to a height of one mile in five minutes, whereas five years earlier more than fifteen minutes were required, the flight being then in a series of wide spirals.

The Monoplane. The monoplane differs from the biplane principally in its wings, or planes. The former has but one plane on each side of the body, therefore but one supporting surface instead of two, as in the biplane. The most conspicuous monoplanes are the French Nieuports, the Blériot and a model by Levavasseur. The monoplane is speedy, but has not the carrying capacity of the biplane.

A powerful 400-horse-power engine in machines heavily loaded burns thirty gallons of high test gasoline each hour—one gallon every two minutes. The largest British machine, above referred to, burns in its four engines 108 gallons of gas in an hour. The delicate machinery is oiled with castor oil.

The Hydroaeroplane. In 1910 a Frenchman, Fabre, designed a flying machine on which he placed floats instead of the usual sets of wheels as landing devices. He made the floats large enough to support the machine on the water. This invention made of the airship a flying boat, and decreased, if it did not entirely remove, the dangers incident to forced landing on a body of water. Moreover, the new machine, called *hydroaeroplane,* at once broadened the use of the flying machine, for henceforth it could be made with safety a part of the naval equipment of nations. Not only could the hydroaeroplane alight on the water when necessary, but it could be propelled through the water at good speed and could rise from it into the air with perfect ease.



PRINCIPAL PARTS OF A BIPLANE

For several years floats were used such as were designed by Fabre, but Glenn Curtiss, the American, in a later model abandoned the floats and substituted a boat body on which he built the airplane superstructure. This form has been very generally followed.

Speed Records. Reference has been made to the speed of the most modern war machines. Civilian records have not equaled the records of military aviators, for after the World War began aeroplane production in all countries was commandeered by the various warring governments. From 1915 to 1919 the airship was entirely a war weapon.

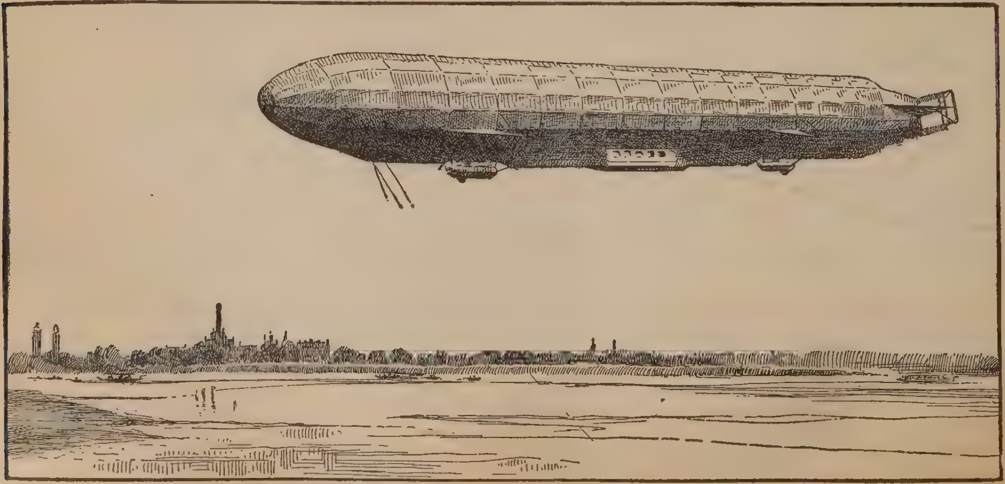
However, civilian records before the war are worthy of note. In 1909 Glenn H. Curtiss flew 47.04 miles per hour, and won the Bennett trophy for greatest speed yet attained; in the following year Grahame-White flew 64 miles at the rate of 61 miles an hour, in a Blériot. For only a year did that record stand; in 1911 another monoplane, a Nieuport, traveled 72.78 miles in an hour, an increase in speed of nearly thirty per cent, but almost at once another type of monoplane went at the amazing rate of 105.04 miles an hour, in a flight of one hour and eleven minutes.

Competition in aircraft production was so keen that records of one year were greatly eclipsed during the ensuing twelve months, and just before the World War turned all thoughts to military necessities a speed of 124.5 miles an hour in sustained flight was recorded. On November 12, 1918, the day after the war was ended by the signing of the armistice a DeHaviland airplane equipped with a Liberty motor flew from Dayton, O., to Washington, D. C., 430 miles, in three hours and fifty minutes. This was the greatest speed ever recorded—one and seven-eighths miles a minute.

Altitude Records. Low flying did not long appeal to daring aviators. The most serious obstacle to overcome, after sustained flight was possible, was the intense cold of the upper air. Though warmly clothed, airmen suffered in the frosty upper regions. Notwithstanding this, the low and comfortable altitudes of 1,473 feet in 1909 and of 3,445 feet in early 1910 were left behind in December of the latter year, when a Bréliot monoplane ascended 10,499 feet into an intensely cold temperature. By 1912 an altitude of 19,032 feet was reached; in the next year another Bréliot reached 19,650 feet, and a biplane ascended 20,668 feet. A civilian in the first year of the war (1914) reached for a few minutes a height of 26,246 feet—almost five miles above the earth. In 1920 Major Schroeder, an American aviator, reached 36,020 feet altitude, the highest ever attained by man.

Altitude flying became a necessity during the war, in order to escape anti-aircraft gunnery of the enemy, and sustained high altitudes had to be endured. Ordinary clothing thick enough to afford protection impeded the movements of the pilot, and very soon electrically heated clothing was devised; with it an airman could ride in comfort at any altitude. In the last week of the war the remarkable feat of directing the course of airships by wireless telephone was achieved by Americans on the battle front.

Dirigible Balloons. The ordinary balloon is always at the mercy of air currents; its direction is controlled by wind currents. As early as 1850 inventors believed a balloon could be constructed which could defy the wind. In 1852 a Frenchman equipped a cigar-shaped balloon with a small steam engine which established a record of seven miles an hour in controlled flight. That was the beginning of a series of inventions which



A ZEPPELIN AIRSHIP; DRAWN FROM A PHOTOGRAPH

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FERDINAND FOCH, MARSHAL OF FRANCE

culminated in the giant German Zeppelin, named for its inventor, Count Ferdinand Zeppelin.

The Zeppelin Dirigible Balloon. The world-famed Zeppelins are cigar-shaped and when at the height of their much vaunted efficiency had been so enlarged and improved that they were nearly 600 feet in length. The envelope is of silk or linen, and it is stretched over a frame of aluminum. Inside are a dozen or more partitions of aluminum, providing gas-tight compartments. One may be punctured without serious injury or great loss of carrying power. Below the great gas envelope cars are suspended for crew and passengers. Before the war the Zeppelins had been proved practicable for passenger traffic. In 1913 they carried nearly 13,000 passengers from Berlin to Vienna at about double the average speed of trains.

With the outbreak of the World War Germany advertised its reliance upon the Zeppelins as a weapon of war to crush English morale by long-distance flights on bombing expeditions over the British Isles. The failure of these machines to accomplish their purpose was due to the use of hydrogen in the gas envelopes. This gas is extremely inflammable, and when the balloon part of the Zeppelin was struck by bullets from anti-aircraft guns the whole machine burst into flames. After the United States entered the War American chemists discovered a method of producing a noninflammable gas—helium—in quantity, which would have been used in allied dirigibles had the war not terminated when it did (see Helium).

Related Articles. Consult the following titles for additional information:

Balloon
Curtiss, Glenn Hammond
Langley, Samuel Pierpont
Santos-Dumont, Alberto
Wright, Orville and Wilbur
Zeppelin, Ferdinand

FLY'ING SQUIR'REL, a curious little squirrel which does not really fly, but which can glide downward through the air with a movement similar to flight. It accomplishes this by means of an extension of its fur-covered skin on each side of its body, between its fore and hind legs. The little animal runs to the top of a tree, leaps out, spreading its legs and at the same time stretching out this side skin, which resists the air like a parachute. In this position the squirrel can glide sixty feet through the air, but only in a downward direction.

These animals are nocturnal in their habits, sleeping during the day and roaming the woods for food at night. They feed on nuts and leaf buds, and also on the eggs of birds and even the young, when obtainable. The common flying squirrel of the eastern part of the United States is about five inches long, exclusive of its bushy tail. It has bright black eyes and soft fur, which is grayish on the upper and white on the underneath side of the body. The *tagnan*, the large flying squirrel of India, is sometimes called the *flying marmot* or *flying cat*.

FLY'WHEEL, a heavy wheel attached to the revolving shaft of a steam engine to secure uniform motion to machinery. When a body is once set in motion its motion continues until the starting force is exhausted. Thus a wheel set to rotating continues to rotate even after the force that started it is removed. The heavier the wheel the greater the force required to set it in motion and the longer it will rotate after the starting power ceases to act. Thus the flywheel accumulates force and equalizes power by resisting sudden accelerations of speed and preventing sudden retardations of motion.

FOCH, *fawsh*, Ferdinand (1851–), a great French military leader, under whose command the united allied armies brought about Germany's surrender in the World War. He was born in the Pyrenees Mountains. When a youth he became a lieutenant in the French army, and was one of the participants in the Franco-German War. When the World War broke out he was in command of a corps at Nancy, and in the first fighting showed such ability as a leader that General Joffre placed him in command of the Ninth Army at the Battle of the Marne, where he contributed materially to the victory that was won. Foch was then made chief assistant to Joffre in directing allied operations in the north of France, and in October, 1917, was appointed Chief of Staff. In that capacity he helped to steady the Italian front along the Piave River, and in February, 1918, he became chairman of the Executive Committee of the Supreme War Council.

In March came the great crisis of the war, with the German drive that threatened Paris and the Channel ports. In this supreme emergency the allies placed all of their forces under the command of Foch, as a result of which the armies acted in unison, and the tide was turned. The masterly way in which he directed the allied forces in the counter-offensive proclaimed him one of the greatest strategists of history. General Foch was honored with the dignity of marshal, which gave him equal rank with Joffre. See WORLD WAR.

FOG, or **MIST**, a cloud at or near the surface of the earth, produced by the condensation of the invisible vapor of the atmosphere into minute, watery particles. This condensation is caused by a cold current of air or the presence of a cold surface, as that of an iceberg. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day. Recent experiments would seem to show that there is an intimate connection between fogs and the invisible dust of the atmosphere; that in fact the invisible atmospheric dust is not only necessary to the formation of fogs, but also of clouds and rain.

FOLK'LORE, a nation's legends, traditions, songs and folk tales, beginning in the earliest history of the people and handed down by word of mouth from one generation to another. To folklore belong many Mother Goose rhymes, the tales collected by the Grimm brothers, the story of Cinderella, numerous lullabies and fireside songs, and kindred forms of literature. The subject of folklore is one which engages the attention of the historian, the student of mythology, the sociologist, the religious scholar, and those who specialize in languages and race study.

FOMENTA'TION, in medicine, the application of warmth and moisture to a part of the body, for the purpose of driving tumors away or of easing pain by relaxing the skin. This is accomplished by applying cloths, especially flannels, wrung out of hot water or medicated fluids, such as opium, belladonna or turpentine.

FOND DU LAC', WIS., the county seat of Fond du Lac County, sixty-three miles northwest of Milwaukee, on Lake Winnebago and on the Chicago & North Western, the Minneapolis, Saint Paul & Sault Ste. Marie and the Chicago, Milwaukee & Saint Paul railroads. By way of the Fox River the city has water connection with the Great Lakes. The important manufactures include lumber, flour, paper, machinery, furniture and agricultural implements. The city has a picturesque location, contains a Carnegie Library, an armory, an Elks' Club, a Masonic Temple and Saint Agnes Hospital and Sanatorium, and it is the seat of Grafton Hall, an Episcopal school for girls. The state supports here a women's reformatory. The place was settled in 1836, and was chartered as a city in 1852. Population, 1910, 18,797; in 1920, 23,427.

FONTAINEBLEAU, *fohn taN blo'*, a town of France, in the Department of Seine-et-Marne, in the midst of a forest of the same name, about thirty-five miles southeast of Paris. The town is famous for its palace and its forests. The castle, or palace, of Fontainebleau is one of the most magnificent in France. It occupies the site of a fortified chateau, founded by Louis VII in 1162; this was converted into a magnificent palace by Francis I and was much enlarged by succeeding monarchs until its completion in the eighteenth century. The park is laid out like a vast garden and is adorned with statues, temples, fountains, lakes and waterfalls.

FOO-CHOW. See FU CHOW.

FOOD, any solid or liquid substance which serves to nourish the body, maintain its temperature, and furnish the material necessary for energy and growth. A definition such as this is technically correct, but it fails to express the overwhelming importance of food in the maintenance of society as a whole. Two instances may be cited in support of this truth.

(1) Late in 1918, after the allied nations had imposed armistice terms on defeated Germany in the World War, a condition confronted the victors unknown in the world's history. Because of the breakdown of economic stability there were millions of people in Europe slowly starving or threatened with famine, and it was admitted that unless the hungry nations could be fed all organized governments might be swept away and society be plunged into chaos.

(2) During the period that America was in the war placards were posted everywhere stating in bold letters that food would win the war and that it must not be wasted. In this way the government sought to impress the truth that hungry soldiers cannot fight effectively, nor starving civilians keep up their courage. What Americans saved from their abundant stores served to replenish the empty cupboards of the allies, and the fight against waste did literally win the war.

Food is not only necessary to existence, but it has a vital relation to health. Some foods build tissue, some produce fat, and all yield energy in a greater or less degree. To maintain health and a strong body a person should select his foods wisely, choosing a diet that will best meet his particular needs. It is necessary, then, to know something of the composition of the substances included in the diet, and understand the effects of different foods.

How Foods are Classified. According to their composition, or *make up*, foods are divided into the following classes:

Proteins. These are the only organic food compounds which contain nitrogen. In addition, they are made up of carbon, hydrogen and oxygen, and sometimes sulphur and phosphorus are found in them. They include cheese, lean meat, white of eggs, milk, peas, beans and nuts. The function of proteins is to build muscular tissues, and to replenish wasted energy. While proteins are of great importance in maintaining bodily vigor, they must not be eaten to excess. Undigested protein foods cause the formation of putrefactive bacteria, and these are a menace to health. The tendency of modern authorities is to advise great moderation in the eating of meat. Some claim that excessive meat eating causes cancer and other diseases.

Carbohydrates, the second group of foods, contain carbon, hydrogen and oxygen, the latter two being found in the same proportions as they occur in water. Starch and sugar are the most important carbohydrates. Starch is found abundantly in wheat, oats, corn, rice and other cereals, and in potatoes; molasses, honey and fruits contain a high percentage of special sugars. Foods containing a high percentage of starch or sugar are good fat builders; they also serve as fuel to yield energy.

Fats, represented by butter, lard, fat meat, olive oil, etc., are a third class of foods. They contain hydrogen and carbon and a small proportion of oxygen. Their chief function is to furnish fuel. As fats are digested less easily than carbohydrates, they must be eaten with moderation.

Heat Units. The energy produced by foods is measured in heat units called *calories.* This is the amount of heat required to raise the temperature of one pound of water four degrees Fahrenheit. According to careful estimates the number of calories in a balanced diet should provide from twelve to sixteen per cent protein, thirteen to seventeen per cent fat, and sixty to seventy per cent carbohydrates.

Foods and Digestion. The wholesome or unwholesome character of any food depends, in a great measure, on the state of the digestive organs and also on the method by which it is cooked, a simple food often being made indigestible by poor cookery. The digestive power of the individual is always to be considered in determining whether a particular food is wholesome or not. In general, therefore, we can only say that that food is desirable which is easily soluble and is suited to the individual's power to digest it. Man is fitted to derive nourishment from both animal and vegetable food, but can live exclusively on either. The people of hot countries live largely on vegetable foods, while the inhabitants of the most northern regions live almost entirely upon fat, on account of its heat-giving property.

Care of Food. Food should always be kept clean and should be handled with particular care to prevent the collection of impurities. This means not only to protect it from visible dirt, but to be sure it contains no germ that will give disease to the person who eats it. Fruit and vegetables kept in dirty streets and peddled from dirty carts may carry the germs of consumption; water and milk may contain typhoid germs, and meats may have parasites that cause much trouble. They can be killed by thorough cooking.

Related Articles. Consult the following titles for additional information:

Adulteration
Bread
Butter
Calorie
Canning
Carbohydrate
Cheese
Chocolate
Cocoa
Coffee
Cookery
Diet
Digestion
Domestic Science
Egg
Fletcherizing
Flour
Meat
Meat Packing
Proteins
Pure Food Laws
Starch
Sugar
Tea

See, also, articles on the various grains, vegetables, fruits, nuts, meats and fish.

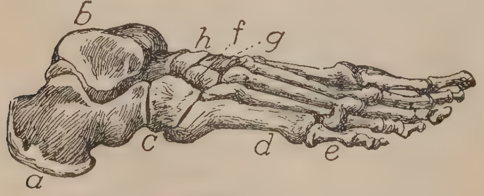
FOOD PRODUCTS, Preservation of. See Canning.

FOOLS, Feast of, the name given to festivals regularly celebrated by the clergy and laity, from the fifth century, to the sixteenth in several countries of Europe. The feast of fools was an imitation of the Roman Saturnalia, and, like this, it was celebrated in December. The young people, who played the chief parts, chose from among their own number a mock pope, archbishop, bishop or abbot and consecrated him with many ridiculous ceremonies, in the chief church of the place, giving such names as Archbishop of Dolts, Abbot of Unreason, Boy Bishop, Pope of Fools. They often travestied the performance of the highest church officers. Masked and disguised, they danced and sang questionable songs and engaged in every conceivable folly which could be practiced by the Church. Except from their association with the Saturnalia, nothing is known of the origin of these extravagances, which appear to have been very ancient. They were most common in France, but the feast was also observed in Spain, Germany, England and Scotland. In France it survived till the year 1644.

FOOT, a measure of length, originating in the length of the human foot in ancient countries. The Greek foot was established as 12.1 inches in length; the Macedonian, 14.08 inches; the Pythian, 9.72 inches. The length of the English foot was determined by Henry I. He declared that the yard should be the length of his arm, and that the foot should be one-third of that length. His arm was thirty-six inches long.

The foot is the unit of line, or linear measure; the square foot, of square measure; the cubic foot, of cubic measure. The square foot contains 144 (or 12x12) square inches; the cubic foot 1,728 (or 12x12x12) cubic inches. See MENSURATION.

FOOT, THE, in man and other vertebrate animals, the lower extremity of the leg, upon which the body rests in standing or walking. In man it extends from the ankle joint to the end of the toes. It includes the *tarsus,* or ankle, made up of seven bones, the *metatarsus,* or instep, made up of five bones, and the *phalanges,* or toes, each of which has three bones, except the great toe, which has but two.



THE FOOT

a, calcaneum; b, astragalus; c, cuboid; d, metatarsal, of which there are five; e, phalanges, of which there are five; f, external cuneiform; g, middle cuneiform; h, scaphoid.

FOOT AND MOUTH DISEASE, a severe infectious disease, which for more than a hundred years has frequently broken out among cattle, pigs and other even-toed domestic animals in Europe and frequently has spread to Asia and Africa. Both mild and severe forms of the disease are known. In the former there is some fever and weakness, during which eruptions appear, especially in the mouth and between the hoofs. Not a large per cent of these cases are fatal, but in the graver form as high as twenty per cent of the animals affected may die. It is particularly fatal among young lambs, and in sheep the eruptions are more persistent and serious, especially on the feet.

The microbe which produces the disease has not been recognized, but it is known that infection may be carried by water and that the bacteria thrive in dark and damp places. Inoculation with serum has not been successful in either preventing or curing the disease. Whenever the disease has been present in a stable, the building should be disinfected and its use should be abandoned for a period. Milk from diseased animals conveys the contagion to man.

FOOTBALL, a very popular sport in the autumn months, second only to baseball among the world's athletic contests. It is the one great national game into which the professional athlete has not entered, for football is a game dominated by amateurs; college students and high-school boys for the most part comprise the players.

The football season is an annual event of first importance in the United States, Canada and England. Exactly the same rules do not apply in all these countries. What is known as the Rugby type is standard football, though the playing rules differ. *Association* football is the second type of the game.

American Rugby. This game is played by two teams of eleven men each, on a field 360 feet long and 160 feet wide. The playing field is 300 feet, or 100 yards long. This field is divided by a cross line in the center;

and parallel to that line cross lines are drawn every 5 yards to the goal lines. In the middle of each end are two long, upright posts, more than 20 feet in height and 18 feet 6 inches apart. A horizontal crossbar 10 feet from the ground connects them. The object of the game is to carry the ball across the goal line of the opposing team or to kick it over the crossbar of the goal posts. When the ball is carried over the goal line, a *touchdown* is scored, and it counts six points for the team that carries the ball. After a touchdown, the successful team is allowed to put the ball in play in scrimmage formation, on the five-yard line. Only one play is permitted. A goal kick, another touchdown either by carrying the ball or by forward pass, counts one point. Under certain conditions the ball may be kicked over the crossbar from the field during the progress of the play, and by this three points are scored for the side making the kick. If a person holding the ball is forced across his own goal line, it is called a *safety* and scores two points for the opposing team.

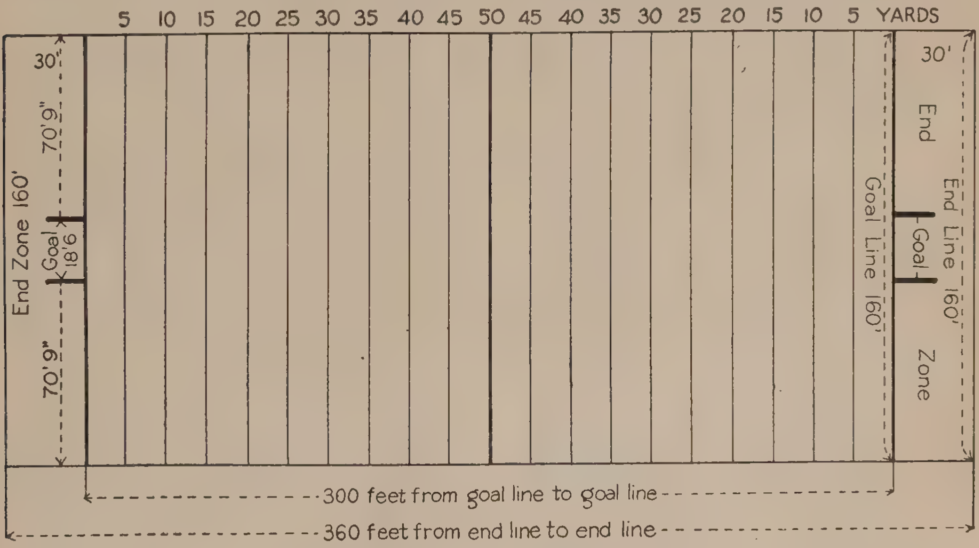

5 10 15 20 25 30 35 40 45 50 45 40 35 30 25 20 15 10 5 YARDS
30'
70'9"
End Zone 160'
Goal 18'6
70'9"
30'
End Zone
Goal Line 160'
End Line 160'
Goal
300 feet from goal line to goal line
360 feet from end line to end line

DIAGRAM OF A FOOTBALL FIELD

A game consists of four quarters of fifteen minutes each, with an intermission of fifteen minutes between the second and third periods, and one minute between the first and second and between the third and fourth. After the first and the third quarters, the teams change goals; at the beginning of the third period the teams take opposite goals from those assumed at the beginning of the game.

At the beginning of a game the ball is placed on the ground in the middle of the 40-yard line of the attacking team. The attacking eleven ranges itself in a line across the field, while the defending side distributes its men over its own side of the field, in positions which are most advantageous to catch and return the kicked ball.

At a given signal the ball is kicked and the line of players rushes forward. One of the opposing players catches the ball and runs with it toward the goal of the kickers off, as far as he may before he is "tackled" and thrown by one of his opponents. He need not have run with the ball, but might have kicked it back to his opponents, but as this would give them possession of the ball, it is a play not often resorted to. When the player with the ball is downed, an official blows a whistle, and the two teams line up with their backs toward their own goals in the positions indicated in the following diagram, in which the squares represent the defending team, and the circles the attacking team. The men on a team are the *center* (C), two *guards* (G), two *tackles* (T), two *ends* (E), a *quarterback* (Q), two *halfbacks* (H) and a *fullback* (F). The men in pairs are distinguished by the word right or left, according as they stand to the right or the left of the center of their own team. Thus, the right guard stands at the right hand of his center. The names of the positions the men occupy are indicated on the diagram (Fig. 1) and, with slight modifications, are the positions they occupy whenever the teams are thus lined up for a scrimmage. The central men of the attacking team stand close together in a stooping posture, the center with his hands on the ball, which lies on the ground between his feet and in front of them.

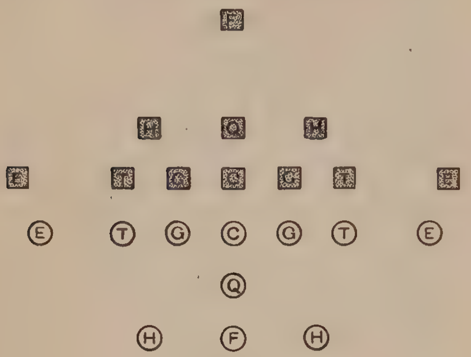


FIG. 1

One of the players, usually the quarterback, calls the signals, which indicate what particular play is to be used. Then, after the quarter has signaled to the center that he is ready to receive the ball, the latter passes it quickly between his legs to the quarterback, who seizes it and gives it to one of the men behind him, who takes the ball and attempts, with the aid of his companions, to run through or around the line of the defending team and toward their goal, until he is tackled and thrown. Here the teams form again for another scrimmage, when a new play is executed in a similar way. If within a specified number of trials a certain distance is not made, the attacking team must give up the ball to their opponents who then become the attacking team and try to carry the ball toward the opposite goal.

It is permissible for the attacking team to kick the ball instead of to carry it, if they prefer, and this is usually done, at least on the last trial, when, if they fail to make the required distance, the team would be obliged to give up its ball. Whenever a team comes within striking distance of its opponents's goal, it may form in a different manner and attempt either a *drop* or a *place kick*, and if either is successful a score is made as indicated above. If the kicker fails to make goal, the ball is brought out to the 20-yard line and there the two teams line up in scrimmage formation with the ball in possession of the defending team.

Qualities of Players. Football calls for great strength on the part of some of the players; for speed and agility from others, and for quickness of thought and loyalty to team-mates from all. No team can succeed that does not play as a unit. Each man must not only know the duties of his own position accurately, but he must know how to play it to the best advantage of the rest of the team and must know when and how to assist each of the others. When the signals are given and any specific play is called for, every man on the team knows exactly what he is expected to do, and the play is successful only when each man does as nearly as possible that which he is expected to do.

Standard Plays. The many competent coaches have succeeded in devising a great number of effective plays, which may be grouped in two classes, those special plays which are good only occasionally, or are in the nature of surprises, and the standard or regular plays, which are repeated again with only such slight modifications as are necessary to deceive the opposing team. Of the standard plays, two types are most common. In one of these the players try to carry the ball directly through the line of the opponents, and in the other they carry it around the end of the opponent's line. It is evident that both of these types are susceptible of a great number of variations, dependent upon the person who carries the ball and upon the particular point to which he directs his attack.

Figure 2 shows what is done by the attacking team when the fullback tries to go between his center and right guard, and, with the assistance of the men behind him, carry the ball through the line of his opponents. The short double lines show where the ball is tossed; the black circle and the heavy black line indicate the man with the ball, and his course; the solid lines show the paths of the men who precede the ball, and the dotted lines show the courses of the men who follow behind the ball and push. In Figure 3 the course of the players trying to take the ball around the right end is shown. The lines have the same meaning as in Figure 2. It should be noticed in this that the quarterback and the right halfback go between the men carrying the ball and the opposing team, to form what is called the *interference.*

Several officials are required to interpret and enforce the rules in each game—the *referee,* whose specific business it is to watch the ball; the *umpires,* who watch the conduct of the players; the *linesmen* who determine how far the ball has been advanced, count the time taken out and are also responsible for detecting certain classes of fouls, especially offside play and roughness. The football quarter consists of 15 minutes of actual play, and whenever the game is stopped for any reason, time is "taken out." The rules of the game are so numerous and complicated, and they change so from year to year, that the only way of being certain of them is to study the current manual.

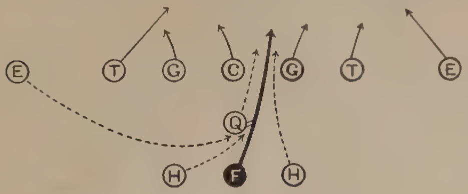


FIG. 2

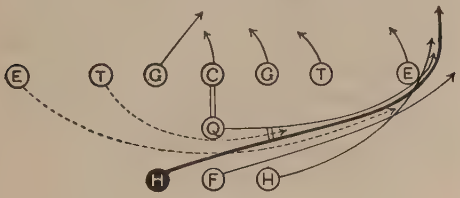


FIG. 3

Canadian Rugby. The game in Canada does not permit of *interference;* that is, a player is not allowed to precede a runner to protect him from opposing tackles. The rules differ from the American, further, in that off-side players must not approach within three yards of an opponent who is attempting a free catch of the ball, even if it has bounded on the ground. There are fourteen men in the team. The game is scored as follows: for a *try and goal,* six points; for a *try,* five; for a *drop-kick,* three; for a *drop-kick* or *place-kick* after a penalty, two; for a *safety-touch,* two; for a *rouge,* one.

These names are explained as follows: A *try* corresponds to a touchdown in American football. If a team is downed with the ball behind its own goal line, a safety-touch is counted against it if it has carried the ball there itself, a *rouge* if the other side has sent or carried it over the line. A rouge is also scored when a team secures the ball more than twenty-five yards behind its opponent's goal, or both behind the goal and outside of the touchline (side line).

English Rugby. This type of game differs in only a few details from the Canadian game. The English retain what is known as the *scrummage* and the *throw-in,* both of which have been discarded in Canada and the United States. The throw-in is employed when the ball goes out of bounds at the side of the field. The ball is thrown upon the field between the two teams, each lined up parallel to the 5-yard lines. In the scrummage the forwards (eight members of each team) gather around the ball and push each other with their heads, each side trying to heel the ball into such a position that its backs may get it and carry it away. Fifteen men constitute an English team.

Association, or ''Soccer,'' Football. This is a type of game originated by the London Football Association in 1863, hence its name. The word *soccer* is an English slang term derived from *association.* The game continues ninety minutes, with only one minute intermission in the middle of the game. It is more lively, or more continuous, than Rugby football.

The ball is kept on the move up and down the field, pausing only as opposing players strive for its possession. It is bunted from the heads of players, kicked along for short distances, either forward or sidewise to another player, and by such tactics brought nearer to a net stretched between the goal posts, into which it is kicked. It is seized then by the goal keeper and kicked into midfield, where the struggle begins again.

Spaldings Football Guide, issued annually, is recommended for rules of the game. Consult, also, Yost's Football for Player and Spectator.

FOOTE, Andrew Hull (1806–1863), an American naval officer, was born in New Haven, Conn. He was graduated from West Point and entered the navy in 1822. He was promoted rapidly, receiving successively command of the Boston and Brooklyn navy yards and later command of the brig *Perry,* with which he cruised the African coast in the interest of American commerce and to put a stop to the traffic in slaves. In 1852 he was promoted to the rank of commodore. In 1861 he directed the attacks on Forts Henry and Donelson and the following year was transferred from the western flotilla and put in charge of the bureau of equipment and recruiting. In June, 1863, he was appointed successor to Rear-Admiral Dupont, in command of the fleet off Charleston, but he died before assuming the duties of this position.

FOOTE, Arthur (1853–), an American concert pianist, organist and composer. He was born at Salem, Mass., and was educated at Harvard University. His training in music was thorough, and his compositions won for him an honorable place among American composers. The first of his compositions to attract serious attention was *Trio in C Major,* for piano and stringed instruments. This was followed by compositions in a variety of forms. His larger works for orchestra include a *Symphonic Prologue, Suite in E Major* and *Francesca da Rimini.* Popular among his concert pieces are his musical settings of Longfellow's *Wreck of the Hesperus* and *Hiawatha.* His songs, of which there are nearly a hundred, have endeared him to a wide public. The best known of these are *I'm Wearin' Awa', I Arise from Dreams of Thee, In Picardie* and *My Love's Like a Red, Red Rose.*

FOOTE, Mary Hallock (1847–), an American author and artist, born in Milton, N. Y. She married a mining engineer and lived after her marriage in Colorado, Idaho and California. Much of the material for her novels she drew from her experiences there. *The Desert and the Sown, The Prodigal, Coeur d'Alene* and *The Led Horse Claim* are some of her works. She also produced many pen and ink sketches for magazine and book illustrations.

FOOT POUND, in physics, the term expressing the unit selected in measuring the work done by a mechanical force. A foot pound is the work done by a force of one pound working through a distance of one foot. It is the unit of the English system for measuring force.

FOOT ROT, a disease in the feet of sheep, the more common form of which is an extensive growth of hoof, which at the toe, or round the margin, becomes turned down and cracked or torn, thus affording lodgment for sand and dirt. In the second form of the disease the foot becomes hot, tender and swollen. Ulcerations form between the toes and are followed by the formation of proud flesh.

FORAMINIF'ERA, tiny shell-covered animals, which, with few exceptions, live in the ocean, from the surface to great depths, sometimes attached to other bodies. When free they move themselves about by means of a whiplike projection. With few exceptions they are microscopic in size. Examined closely, their shells display a variety of forms, some of them of great beauty. One species is star-shaped, another is oval, others are spherical or spindle-shaped. All are covered with minute perforations which give them the appearance of being delicately carved. The animal deposits of chalk, found both in Europe and America, are composed principally of the fossil shells of foraminifera.

FORBES-ROBERTSON, Sir Johnston (1853–), one of the foremost English actors of his day. He was born in London and educated at Charterhouse and the Royal Academy of Arts. Abandoning his idea of becoming a painter, at the age of twenty-one he went on the stage, and gained steadily in art and in popularity, both in England and in America. At various times he played with Mary Anderson, Sir Henry Irving and Mrs. Patrick Campbell. The plays in which he was especially successful include *Hamlet, Pelleas and Melisande,* Shaw's *Caesar and Cleopatra, The Passing of the Third Floor Back* and *The Light that Failed.* He married Gertrude Elliot, sister of Maxine Elliot. In 1913 he was knighted.

FORCE, *fors,* in physics, that agency by which the motion of a body is increased, diminished or changed in direction. In mechanics force is measured by the velocity it produces in a given mass in a definite length of time. The illustration of the effect of a constant force upon a moving body is shown in the law of falling bodies (see Falling Bodies). There are two systems for measuring force, the English system, which uses the poundal as the standard of measure (see Poundal), and the Metric system, which uses the dyne (see Dyne).

A central, or *centripetal,* force is one that draws toward a center. *Centrifugal* force is a term used to denote the force which gives a revolving body a tendency to fly off in a straight line known as a *tangent.* A good illustration of this occurs when mud or water is thrown from the rim of a rapidly-revolving wheel. The *field* of a force is the area within which it acts. In the case of gravitation this field is infinite, but in mechanics it is restricted to the area within which a given force produces discernible effects.

FORCE BILLS, the name given to acts passed by the United States Congress at various times to force state compliance with Federal statutes. In 1833 such a law was aimed at South Carolina's effort to nullify the tariff act of 1832 (see NULLIFICATION). In 1870 another act made punishable by fine or imprisonment any attempt to intimidate, bribe or hinder qualified voters from expressing themselves at the polls. April 20, 1871, another bill, also known as the Force Bill, was passed by Congress, directed against the Ku-Klux Klan and similar societies, organized systematically to evade Federal laws in the South.

The name has also been applied to the Lodge election bill, passed by the House of Representatives in 1890, by which the control of certain elections was placed with the Federal government. It was defeated in the Senate.

FOR′CEPS, a two-pronged instrument used for grasping and picking up objects. It is one of the most useful of hand tools, and is made in a variety of forms and sizes to meet the varying needs to which it can be put. Forceps are used by dentists in extracting teeth, by watch makers in handling the small parts of watch works; by surgeons in grasping and holding parts while dissecting, in extracting splinters from wounds, and in other work of a similar sort.

FORD, HENRY (1863–), a Detroit automobile manufacturer who rose from a condition of poverty in middle age to become within twenty years one of the world's wealthiest men. He is credited with "putting America into automobiles," because he manufactured the world's lowest-priced car and shipped from his factory 4,000 complete cars every day. As a factory organizer he probably stands in the forefront of industrial leaders.

Ford was born in Greenfield, Mich., but removed to Detroit in 1887, where he learned the trade of machinist, and soon became chief engineer of the local electric light company. In 1903, after much toil in perfecting an internal-combustion engine, he organized the Ford Motor Company. This has grown to be the world's largest manufactory of automobiles. In 1914 he stirred the industrial world with the announcement of a vast profit-sharing plan with his employees. At this time $5 per day became the minimum wage in his factories. An avowed pacifist, he caused a mild sensation in 1915 by his attempt, through a voyage to Europe in a "peace ship," financed by himself, to achieve the immediate ending of the World War. In 1918 he was the Democratic nominee in his state for the office of United States Senator, but was defeated.

After the United States entered the war Ford turned his great factories largely over to government work. When the war was over he announced his intention of starting a new organization to manufacture a small automobile lower in price than any other car on the market; including the one which made him famous. He also began the publication of an international liberal weekly, called the *Dearborn Independent.*

FORD, PAUL LEICESTER (1865–1902), an American novelist and historical writer, was born in Brooklyn, N. Y. Of his novels the best known are *Janice Meredith* and *The Honorable Peter Stirling*. The latter is the story of a young attorney's struggles to gain recognition, and is said to be based on the life of Grover Cleveland. Among Ford's historical writings are *The True George Washington,* an original treatment of the subject in which the first President is pictured with all his physical defects and personal shortcomings, but lovable withal. *The Many-Sided Franklin* and *The Writings of Thomas Jefferson* are among others of this class. In a dispute over money matters Mr. Ford, who was a cripple, was shot by his brother Malcolm, who then committed suicide.

FORECLOSURE. See MORTGAGE.

FOREIGN MONEY. See COINS, FOREIGN.

FOREIGN PHRASES, *frazes.* There are a number of phrases from foreign languages which appear occasionally in English writings, or are heard in current speech. The list below contains some of the more important, with their meanings. The following abbreviations are used: L. for Latin; F., French; It., Italian; Gr., Greek; G., German.

ad extremum (L.), to the last degree.
à la mode (F.), according to the fashion.
anno domini (L.), in the year of our Lord.
à pied (F.), on foot.
à propos (F.), suited to the occasion.
auf wiedersehen (G.), till we meet again.
au gras (F.), with or in fat.
au gratin (F.), with a crust.
au jus (F.), in the juice.
au revoir (F.), till we meet again.
beaux yeux (F.), pretty eyes; a fair face.
belle dame (F.), beautiful lady.

bête noire (F.), black beast; a thing to be abhorred.
billet doux (F.), love letter.
bona fide (L.), in good faith.
bon ami (F.), good friend.
bon diable (F.), good-natured fellow.
bon jour (F.), good day.
bon mot (F.), clever saying.
bon soir (F.), good evening.
bon voyage (F.), a prosperous journey to you.
caro sposo (It.), dear husband.
carpe diem (L.), enjoy the present moment; embrace the opportunity.
caveat emptor (L.), let the buyer beware.
cave canem (L.), beware of the dog.
c'est à dire (F.), that is to say.
chacun à son goût (F.), every man to his taste.
chemin de fer (F.), railway.
cher ami (F.), dear friend.
cherchez la femme (F.), look for the woman.
cogito, ergo sum (L.), I think, therefore I am.
comme il faut (F.), as it should be.
contrat social (F.), social compact.
coup d' état (F.), stroke of policy; unexpected, decisive show of authority.
cum laude (L.), with praise.
deo gratias (L.), thanks to God.
deus ex machina (L.), a god from the machine; any artificial handling of a situation.
ecco (It.), look here; look there.
enfant terrible (F.), terrible child.
en garçon (F.), as a bachelor.
en route (F.), on the way.
en suite (F.), in a series or set.
entre nous (F.), between us; confidentially.
ex cathedrâ (L.), from the chair; with authority.
exeunt omnes (L.), all go out.
ex officio (L.), by virtue of one's office.
ex post facto (L.), from something done afterward.
factum est (L.), it is done.
gaudeamus igitur (L.), let us then rejoice.
grâce à Dieu (F.), thanks to God.
grande dame (F.), great lady; a woman of high rank.
grande toilette (F.), full dress.
grand monde (F.), refined society.
habeas corpus (L.), you are commanded to have the body.
hoc loco (L.), in this place.
hoi polloi (Gr.), the masses.
homme d'affaires (F.), business man.
honi soit qui mal y pense (F.), evil be to him who evil thinks.
honoris causa (L.), for the sake of honor.
hora fugit (L.), the hour flies.
ich dien (G.), I serve.
in excelsis (L.), in the highest.
in fine (L.), at the end.
in statu quo (L.), in the state in which it was before.
lares et penates (L.), household goods.
le roi est mort, vive le roi (F.), the king is dead, long live the king.
l'état, c'est moi (F.), I am the state.
le tout ensemble (F.), the whole taken together.
locus in quo (L.), place in which.
ma foi (L.), upon my faith.
magna cum laude (L.), with great praise.
mal de mer (F.), seasickness.
meum et tuum (L.), mine and yours.
nez retroussé (F.), a turned-up nose.
noblesse oblige (F.), nobility obliges (one to live up to certain standards).
nullus sum (L.), I am no more.
ora pro nobis (L.), pray for us.
par exemple (F.), for example.
pardonnez-moi (F.), pardon me.
parole d'honneur (F.), word of honor.
pax vobiscum (L.), peace be with you.
persona non grata (L.), a diplomat not acceptable personally to the sovereign or government to which he is assigned.
pièce de résistance (F.), the principal work in a collection; the most substantial dish of a dinner.
place aux dames (F.), make way for the ladies.
post bellum (L.), after the war.
pro bono publico (L.), for the public good.
pro patria (L.), for native land.
que voulez-vous (F.), what will you!
raison d'état (F.), reason of state.
raison d'être (F.), a reason for being.
rara avis (L.), rare bird; prodigy.
répondez s'il vous plait (F.), reply, if you please. (R. S. V. P.)
requiescat in pace (L.), may he rest in peace.
res ipsa (L.), the thing itself.
resurgam (L.), I shall rise again.
sans souci (F.), without sorrow.
semper fidelis (L.), always faithful.
s'il vous plaît (F.), if it pleases you.
sine mora (L.), without delay.
sotto voce (L.), in an undertone.
sub rosa (L.), in strict confidence.
tempus fugit (L.), time flies.
tuum est (L.), it is thine.
uti rogas (L.), as you ask.
vanitas vanitatum (L.), vanity of vanities.
veni, vidi, vici (L.), I came, I saw, I conquered.
via crucis (L.), the way of the cross.
vive le roi (F.), long live the king.
volente Deo (L.), God willing.

FOREORDINATION, *fohr or di na' shun,* a doctrine held by certain Protestant sects. According to this belief every event in the history of man is a part of God's purpose and it is foreordained by Him. To take any other view, they think, would be to imply that God's knowledge and power are limited. Wrongly interpreted, the doctrine is almost as gloomy as fatalism (which see), or the belief that events take place in a destined and absolutely fixed order, that some persons were created to sin and be damned, while others were made to do good works and enjoy eternal bliss. Foreordination was a fundamental of Calvin's theology.

FORESHORT'ENING, a principle in art which gives the illusion of space. In drawing and painting on a flat surface the artist can actually give his figures only two dimensions, length and breadth; he must furnish an illusion of the third by means of foreshortening; that is, if he wishes to represent realistically any object he must shorten all lines which are not perpendicular with a line from the eye of the spectator to the center of the picture. To illustrate: hold a six-inch pencil horizontally on a level with the eyes so that the ends will be the same distance from the eyes. Keeping it horizontal, turn it until a line starting between the eyes would pass through the lead from end to end. In changing its position the pencil appears to grow shorter and shorter. In its last position it would be foreshortened to the limit and correctly represented by a point. Foreshortening is further outlined in the article DRAWING.

FOR'ESTERS, ANCIENT ORDER OF, a fraternal society, founded in 1745 in Yorkshire, England. It was introduced into the United States in 1832, the first court being organized at Philadelphia. In 1918 there were over 9,000 courts, with a membership of about 1,600,000, of whom 50,000 were in the United States and Canada. There are in the United States three high courts and over 440 subordinate ones. Over $5,000,000 is disbursed annually in benefits.

FORESTERS, INDEPENDENT ORDER OF, a fraternal organization, founded at Newark, N. J., in 1874, and reorganized in 1881. It has branches in Canada, Great Britain, Norway, France, India and Australia. In 1918 there were in the United States fifty-five high courts and 4,150 subordinate courts, representing a membership of 218,500. Nearly $4,000,000 a year is disbursed in benefits at the present time; the total disbursements to 1919 have been over $40,000,000.

FORESTERS OF AMERICA, a fraternal society which was organized under its present name in 1895. Originally it was a part of the Ancient Order of Foresters. It was introduced into the United States in 1882, and seven years later became an independent organization. In 1918 it had eighteen grand courts and 1,560 subordinate, and a membership of over 206,000. Over $44,000,000 has been disbursed in benefits.

FORESTS AND FORESTRY. The poet Bryant in his *Forest Hymn* speaks of the forests as "God's first temples." Ages ago the greater part of the earth's land surface was covered with trees, and it was in forested areas that primitive man began his long journey to civilization. The settlement of new lands as mankind has advanced to a higher plane has resulted in the destruction of vast numbers of trees, and today there are great open spaces which were once covered with dense forests. South America and Africa possess the largest tracts of untouched woodlands, and in North America the most extensive of these are in Canada, where there are 600,000,000 acres of timber. The forests of the United States, notwithstanding the rapid development of the country, cover about 550,000,000 acres.

In Europe, Russia, Germany, Switzerland and the former Austria-Hungary have the largest area of woodland. In Asia, the densest forests are founded in India, on the southern slope of the Himalayas. Large forests also occur in Siam and Burma and in the northern portion of the Chinese Empire and Siberia. The kinds of trees most numerous in any particular forest depend upon the temperature, the amount of moisture and the nature of the soil. In the forests of the cold temperate climates cone-bearing trees, such as pine, spruce and hemlock, are the most numerous. These are usually interspersed with beech, maple, birch and other hard woods. In the warm temperate climate deciduous trees, such as the oak, prevail, while the forests of the tropical regions are characterized by numerous species of palms. Mingling with these are found mahogany, teak and climbing plants of gigantic size.

Value of Forests. In a general way it may be said that forests are of direct and indirect value; direct, through the produce which they yield; indirect, through the influence which they exercise on climate, the amount of moisture, quality of the soil, healthfulness and beauty of the country. It is clear that a piece of land without vegetation is exposed to the full effect of the sun, rain, snow and wind. If, on the other hand, the land is covered with a growth of plants and trees, it enjoys certain benefits which modify the effect on soil and air. These benefits are all due to the vegetable life; the crowns of the trees cut off the sun's rays and the falling rain; the leaves, flowers, etc., besides certain plants which grow in the shade of trees, form a layer of mold which protects the soil against rapid changes of temperature, and greatly influence the movement of water in it; the roots of the trees penetrate into the soil in all directions and bind it together.

The effects of these factors are more numerous than are generally recognized. The most obvious, probably, is the difference in temperature. A lower temperature tends to keep more moisture in the air, and consequently more rainfall is likely. In lowlands, it is true, the effects of forests on the amount of rainfall are probably very small, but in highlands they are quite noticeable. The vegetation tends to regulate the water supply by keeping the springs well-fed from surface water. A very important fact is that the roots hold the soil together so that the rich surface loam is not washed away by rains. The history of the United States is full of instances where hills and mountain slopes have been made useless for cultivation because the cutting down of the trees has left the fertile soil to be washed down. Where trees are planted near human habitation they reduce the velocity of the wind, protect buildings and adjoining fields, and offer shelter to animals and birds. There can be no question that forests add to the beauty of the country. Surely every man, woman and child will be happier if the surroundings are beautiful than if the country is a barren desert. All these effects of extensive forests deserve consideration. Whether one or the other is the more important is not the question at issue. The fact is that every country under the sun will be benefited by a wise care of its forests.

The direct utility of forests is in their produce, fuel and timber, also material for dyes, medicines and other useful articles. In modern times iron, steel, and concrete have to a large extent replaced timber for building, and coal, peat and similar materials are being substituted for firewood. But wood is still indispensable and seems likely to remain so. Even if no other motive than self-interest dictates the policy of the owners of forests, it is wiser to take good care of the property. Most of the owners of great tracts now realize that the practice of forestry as a definite system is to their own advantage.

United States. The forest areas of the United States cover about one-fourth the entire area of the country, exclusive of Alaska. These forests may be divided into the eastern, western and lake regions. The eastern forest region includes the area covered by the Appalachian mountain system and the Gulf states, extending in some places west of the Mississippi River. In the northern portion of this region and extending as far south as Maryland, white pine is the most abundant and most valuable timber tree. However, in the higher latitudes, spruce, hemlock and fir, commonly known as Canada balsam, are found, and interspersed with these soft woods are maple, beech, birch and a few other hard woods. South of Maryland and continuing through the Gulf states, the yellow or pitch pine is the most abundant. Mingled with this are the cypress, the oak, the ash and a number of other hard-wood trees.

The forests of the lake region surround the Great Lakes and are found both in the United States and in Canada. In the United States they extend from near the Red River of the North, in Minnesota, eastward until they meet the forests of the Appalachian region of Canada. These forests cover large portions of Minnesota, Wisconsin and Michigan and are rich in white pine, the abundance of which has given rise to an extensive lumber industry in these states. Spruce and some varieties of hard wood are also found interspersed with the pine.

The Rocky Mountain forest region extends from the western boundary of the great plains to the Pacific coast and from the Canadian boundary to Mexico. The forests cover the foothills and sides of the mountains as far up as the tree line. They are often separated by wide, treeless regions, some of which are suitable for grazing, while others are barren. Various species of pine are the prevailing trees. On the western slopes of the Sierra Nevada and coast ranges, particularly the latter, the forests become very dense and contain trees of enormous size. The forests in this portion of the region are entirely different from those found in other parts of North America and constitute the immense lumber regions of Washington and Oregon. The redwood, Oregon pine and species of fir and sugar pine are the timber trees most highly valued. Some authorities consider the forests of Oregon and Washington, in proportion to their area, the most valuable in the world.

The mountains and hills of Alaska are covered with a heavy growth of timber, but the trees are smaller than those found in Washington and Oregon. However, they compare favorably in size with those in the forests of the Appalachian region and are suitable for lumber. The Philippine Islands have a forest area exceeding 40,000,000 acres. This is rich in merchantable timber and, with but few unimportant exceptions, the entire region is in possession of the United States and under control of the forest service.

Forestry. Forestry is the cultivation and management of forests for the purpose of saving them from wasteful depletion and of getting the most possible benefits out of them. In most European countries all forests, whether private or public, are under government supervision and must be managed in accordance with carefully prescribed regulations concerning the cutting of timber, the planting of trees and the protecting of young growths.

United States. In early times there was practically no forest management. As long as the forests existed they were looked upon as a free gift of nature, like air and water, and the early settlers in North America, and their descendants for many generations, cut down trees as if future needs were not worth considering. This disregard of the rights of coming generations continued to a comparatively recent date. Though the Division of Forestry was established in 1880, it was not till 1897 and 1898 that it became anything more than an office for collecting figures. As early as 1873 Congress had passed an act granting land to settlers who planted one-fourth of their land with trees, but the act led to no immediate results. During President Cleveland's administration millions of acres of forest land were reserved by executive proclamation. Though the action was misunderstood and attacked, it had the good result of bringing the problems of national forest administration before the people. Since that time the bureau has been an active agency for introducing the practice of scientific forestry on government and private lands and for the education of popular opinion. The efficiency of the bureau was hampered, however, by conflicts of authority with other departments. Various makeshifts were unsuccessful in providing a solution, till finally in 1905 complete control of the reserves was given to the bureau of forestry, the name of which was changed to "Forest Service."

The Forest Service. The organization of the Forest Service is based on the unit of single forests. On the first of January, 1917, the total number of forests was 152, with a total area of 155,166,619 acres. In charge of each forest is a forest supervisor, who has control of the forest rangers and forest guards. Guards are temporary employes; rangers are employed by the year. Their duties include patrol, marking timber and scaling logs, enforcing the regulations, and conducting some of the minor business arising from the use of the forests. The supervisors report directly to and receive instructions from the central office at Washington. For inspection purposes the forests are divided into six districts, for each of which there is a chief inspector with a corps of assistants. The inspectors have no administrative duties, but their reports serve to keep the Washington office informed of the progress of work, and serve as a basis for future action.

Probably the most conspicuous achievement of the Forest Service has been the reduction of loss by fire in the national forests. Forest fires have had more to do with the character and distribution of forests in America than any other factor except rainfall. In many parts of the United States they have occurred regularly year after year. The probability of fire after the first cut commonly results in the lumberman's decision to leave no merchantable timber standing. Forest fires are thus a barrier to the introduction of forestry. A great advance has been accomplished by efficient patrol, by the coöperation of the public, and by preventive measures such as the burning of brush and dead timber on cut-over land. The country as a whole is divided into a number of districts, and each district has an official in charge. About eighty per cent of the outbreaks of fire are held in check or subdued. In 1917 the total expenditure for fire protection amounted to $1,825,000.

Outline on Forestry

I. PURPOSES
II. METHODS
  (1) Of national government
    (a) Forest administration
    (b) Research and experimentation
    (c) Education of the people
  (2) Of the individual states
  (3) Of individuals
III. RESULTS
  (1) Creation and maintenance of forest reserves
  (2) Prevention of forest fires
  (3) Reformation of present methods of lumbering
  (4) Reforesting of denuded areas
  (5) Regulating the cutting of timber on forest reserves
  (6) Forest surveys
  (7) Hydrographic surveys
  (8) Supplying private owners of land with trees for planting
  (9) Sending foresters to lecture in universities and other schools

Questions on Forestry

What are some of the indirect advantages due to forests?

What uses are made of the barks of different trees?

From what trees are the following obtained: dyes, tar, turpentine, quinine, camphor, rubber?

Where is ebony procured? For what is it greatly valued?

What kind of trees would you expect to see were you to travel in Alaska? In Brazil? In the Philippine Islands? In the Hudson Bay country of Canada?

What can you say about the redwood trees of California?

What is the Forest Service? What is its purpose? What has it accomplished so far? How is it organized?

What causes forest fires? What means have been adopted to prevent them?

Does Canada or the United States guarantee better protection to its forest areas?

The Forest Service has earnestly sought the development of all the resources of the national forests. Mature timber has been sold wherever the conditions warranted, always so as to prevent waste, guard against fire and protect young growth. Unnecessary red tape has been eliminated as far as possible. In general the conduct of local business has been entrusted to local officers, while large transactions with general policies were controlled from Washington. Business efficiency and the convenience of the public have been carefully studied.

Besides the administration of the national forests, the Forest Service conducts general investigations, carries on an extensive educational work, and coöperates with private owners who practice proper forest management on their own lands. The coöperation with private owners is due to several causes, of which the most obvious is the need of bringing forestry into universal practice. The lack of information as to how to apply the proper principles of forestry and what returns may be obtained, and the lack of trained foresters outside the employ of the government, are almost equally important reasons. The coöperation takes the form of advice on the ground, and, occasionally, of general working plans. The educational work is performed chiefly through publications, whose object is to spread a knowledge of the principles and practices of forestry throughout the nation. The investigations conducted by the Service extend from studies of the natural distribution and classification of American forests to statistics of lumber production and laboratory researches bearing on the economical use of forest products.

Among the individual states of the United States, forestry has hardly reached beyond the experimental stage. New York has forest reserves to the extent of 1,500,000 acres. It has a commission to care for the reserve; the constitution of the state, however, prohibits the cutting of timber on state land, and thus confines the work entirely to protection and planting. Pennsylvania is at present working out a highly efficient forest policy. Nearly all the states have laws on forest policy but their enforcement has been lax. Fortunately, public sentiment is making rapid progress and there is every reason to believe that the next twenty years will show even greater advances than have been made double that number of years in the past.

FORESTS AND FOREST RESERVES IN CANADA. Canada's original timber area has been reduced as settlement has proceeded westward. The early settlers, coming from Europe had practiced forest conservation at home, but in the New World the destruction of forests on the coast was at first a necessity and later a habit. In the southern portions of the provinces of Manitoba, Saskatchewan and Alberta and in the Peace River Valley, there is a prairie country which is absolutely treeless, except for small clumps of timber in the large river beds and on a few isolated hills. This treeless area covers about 200,000 square miles. Practically the whole remainder of the country was covered with timber when the earliest settlers landed at Quebec. In the maritime provinces and as far west as Manitoba was a great stand of pine; Ontario and Quebec had large bodies of hardwoods; from Nova Scotia to the Yukon was the great spruce belt; and on the Pacific coast was a coniferous forest containing the greatest amount of timber per acre of any forest lands in Canada.

The most important timber areas remaining are in the Pacific regions, where there are great virgin forests of spruce, hemlock and cedar. Between the Rocky Mountains and Hudson Bay there is a broad belt of spruce, tamarack and poplar. In all, Canada has about 600,000,000 acres of forest land.

Forest Reserves. In common with most European countries and in contrast to the United States, Canada is fortunate in that practically the entire forest area is owned by the Dominion or provincial governments. This has greatly simplified the problem of control. To prevent undue destruction of the forests, either by fire or by lumbering, is the reason for creating forest reserves. The reader should understand that timber may be cut under certain restrictions, but no settlements may be made on the reserves. The first Dominion reserve was the Rocky Mountain Park, established in 1887. Since that date there have been thirty additions to the reserves, making a total of over 23,000,000 acres. In 1911 an act of Parliament provided for the formation of a new Rocky Mountains Forest Reserve, including the old Rocky Mountains Park, Jasper Park and Kootenay Lakes reserves. This new national forest has a total area of 11,656,000 acres. The Dominion reserves are all in the western provinces. In addition, the provinces have reserves or parks over 200,000 square miles in extent; Quebec leads with 111,401,280 acres.

The Forestry Branch. The administration of the reserves is in the hands of a commissioner, who resides at Edmonton, and reports directly to the superintendent of forestry at Ottawa. Under the commissioner are the fire rangers and guards who actually cover the territory. To prevent the spread of fires, and so far as possible, to prevent their origin, is the principal business of the rangers. They patrol their districts, mark timber, enforce the regulations and conduct the minor business arising from the use of the forests. In addition to the permanent foresters, the superintendents of the various parks are fire wardens and additional men are employed during the dry season. That the number and extent of fires is decreasing is a tribute to the efficiency of the regulations which have been adopted, but it is an even higher tribute to the character and ability of the handful of men who administer them.

The coöperation of the government with private owners will result in the eventual solution of the second great problem in forestry—the planting of areas which are now comparatively or absolutely treeless. The securing of natural reproduction of a forest depends on the method of removal of the full-grown trees. The forestry branch aims to regulate the cutting of timber on forest reserves so that the conditions shall lead to the plentiful reproduction of the most valuable species. On burned-over land the foresters plan to secure the best results by using proper scientific methods. But the forestry branch aims not only to prevent undue destruction, not only to replace destroyed forests, but actually to create new timber areas. It is here that coöperation with private owners is most obvious, for the government supplies trees free of charge and tells the farmer how to take care of them.

Large nurseries have been established in various parts of the country, and young trees are distributed to settlers. The value of trees for shade, for conserving the water supply, and as windbreaks, is clear. In parts of Manitoba various coniferous trees are being planted as windbreaks for fruit orchards, apparently with excellent results. Quick-growing trees, such as cottonwood are frequently cut for fuel.

FORGERY, *for′jur y,* the fraudulent making or alteration of a writing or instrument, to the prejudice of another man's rights. The punishment of forgery is by fine or imprisonment, or both. Not only have nearly all the states and provinces enacted statutes on the subject to supplement the old common law provisions, but Congress has passed additional laws; state laws must be made to conform to these.

FORGET, *for′zhay,* AMADEE EMMANUEL (1847–), a Canadian barrister and legislator, born in Marieville, Quebec. He began the practice of law in 1871. In 1875 he was secretary of the Manitoba Half-Breed Commission; from 1876 to 1888 he was clerk of the Northwest Council. For five years he was assistant Indian Commissioner for Manitoba and the territories, and from 1894 to 1898 was Commissioner. He richly deserved his promotion, in the latter year, to the Lieutenant-Governorship of the North West Territories, and when the province of Saskatchewan was organized in 1905 he became its first Lieutenant-Governor. At the end of his term of office in 1911 he was called to the Dominion Senate.

FORGET′-ME-NOT, a common annual or perennial herb. Nearly fifty species are known. Its flowers are bright blue with a yellow eye. The dark blue forget-me-not of the Azores is now cultivated in greenhouses and is much admired for its brilliancy. An interesting fact is that this plant is called "forget-me-not" in many languages, and that the flower is a symbol of friendship throughout the world. The forget-me-not is sometimes called *scorpion grass.*

FORGET-ME-NOT

FORMAL′DEHYDE, a compound of oxygen, hydrogen and carbon, obtained by the oxidation of wood alcohol. In other words, formaldehyde is wood alcohol with the hydrogen removed. Pure fomaldehyde is never obtained, the chemical process yielding a solution of 35 parts of formaldehyde to 65 parts of water. Formaldehyde solutions, often under the name of *formalin,* are used as disinfectants and in the manufacture of certain dyes and other chemicals.

FORMIC ACID, an acid so named because it was first obtained from the bodies of ants (Latin *formica*) by steeping them in boiling water. The same acid is contained in human sweat, in the common nettle and in other plants and may be prepared artificially in various ways. It is a colorless, violatile liquid, with pungent odor, and has economic uses as a food preservative.

FORMO′SA, called by its inhabitants and by Japan TAIWAN, is an island in the Chinese Sea, belonging to Japan, and separated from the Chinese province of Fukien by a strait about eighty miles wide at its narrowest point. The island is about 250 miles in length and seventy miles in average breadth. The area is 13,839 square miles—somewhat exceeding that of Maryland.

It is divided by a central range of mountains, with peaks from 7,000 to 15,000 feet high, into a western and eastern part, the former of which is occupied by Chinese and is highly cultivated, producing in abundance corn, rice, sugar, pepper, camphor, oranges and bananas. The eastern part is inhabited mainly by wild tribes of the Malayan race, who are gradually disappearing before the Chinese. The chief exports are tea, camphor, sugar, indigo, hemp and timber; the imports are cotton and woolen goods and opium.

Nearly all of Formosa's tea is shipped to the United States. The camphor industry is a government monopoly. The Dutch exercised power over part of Formosa in the seventeenth century. It was ceded to Japan by China in 1895 at the close of the China-Japanese War. Population, 1916, 3,710,848. The chief town, Taihoku, has 102,250 people.

FOR′REST, EDWIN (1806–1872), an American actor, born in Philadelphia. He showed an early talent for the stage and in 1820 made his début at Philadelphia, as the hero in Home's play of *Douglas.* In 1826 he appeared before the New York public as Othello, with signal success. In 1836 he visited England, and he later made a second and a third visit. He continued with great success at New York till 1871, when he retired.

FORT. See FORTIFICATION.

FORT COLLINS, COLO., the county seat of Larimer County, seventy-four miles north of Denver, on the Cache la Poudre River and on the Colorado & Southern and Union Pacific railroads. The surrounding region is made fertile by an extensive system of irrigation. There is a beet-sugar factory, and there are also alfalfa mills and flour mills and an irrigation headgate plant. Fort Collins has the state agricultural college; in connection with it is a United States horse-breeding station. There is a Carnegie Library, a theological seminary, and the headquarters of the state national forest service. The commission form of government was adopted in 1913. Population, 1910, 8,210; in 1920, 8,734.

FORT DEAR′BORN, a fort built on the site of the present city of Chicago in 1804 (see CHICAGO, subhead *History*). It was the scene of a massacre on August 15, 1812, when the garrison of 67 men and some thirty settlers evacuated the fort under orders from General William Hull. They were attacked in ambush by a force of 500 Indians, assisted by others who had promised to escort them to safety, and fully two-thirds of the party were killed. The fort was destroyed on the following day by the Indians, was rebuilt in 1816 and demolished in 1856.

FORT DODGE, IOWA, the county seat of Webster County, eighty-seven miles northwest of Des Moines, on the Des Moines River and on the Illinois Central, the Chicago Great Western, the Fort Dodge, Des Moines & Southern and the Minneapolis & Saint Louis railroads. Extensive deposits of gypsum are found here, and the city has one of the largest gypsum mills in the world. Other manufactures include brick, tile, sewer pipe, stoneware, oatmeal, shoes, carriages, clothing, brooms and pumps. There are large coal deposits in the vicinity, also deposits of glass sand and sandstone. The city has a Carnegie Library, Tobin College, Mercy Hospital and a fine court house. The commission form of government was adopted in 1911. Population, 1910, 15,543; in 1920, 19,347.

FORT DON′ELSON. See FORT HENRY AND FORT DONELSON.

FORT DUQUESNE, *du kane′*, a fort erected by the French in 1754, at the junction of the Allegheny and Monongahela rivers in Pennsylvania. It became at once the center of French military authority in the region drained by the Ohio River and its tributaries. It was for the purpose of reducing this fort that the expedition under General Braddock set out in 1755 (see BRADDOCK, EDWARD). Another English expedition of 800 men, for the same purpose, was almost destroyed in October, 1757, but the fort was finally captured in September, 1758. The name of the fort was changed to Fort Pitt, in honor of the great English statesman, and later the city which grew up on the spot was named Pittsburgh.

FORTH, an estuary of Scotland. The river is formed in Perthshire by the junction of two streams, the Duchray and the Dhu, about one mile west of Aberfoyle. From Aberfoyle the river flows southeasterly, forming for a considerable part of its course the boundary between the counties of Stirling and Perth, winding in its lower course in a series of curves, and expanding into the Firth of Forth, which forms the most important harbor or refuge north of the Humber. The Firth is fifty miles long and fifteen miles across. At Queensferry a great cantilever bridge crosses the Firth.

Forth Bridge, a railway bridge across the Firth of Forth, in Scotland. It is of the cantilever type (see BRIDGE, subhead *Cantilever Bridges*) and on account of the length of its spans is one of the most remarkable bridges in the world. It has two short arms of 680 feet each, two main spans of 1,710 feet each, fifteen spans of 168 feet each and seven small arches. The total length is 8,295 feet, or one and a half miles, one mile of which is covered by the cantilevers. The highest point is 361 feet, and the center of the bridge is 152 feet above high water. This bridge was completed in 1889 at a cost of $13,000,000.

FORT HENRY AND FORT DON′ELSON, two forts in Tennessee, near the Kentucky border, the first situated on the right bank of the Tennessee River and the second on the left bank of the Cumberland River. They were erected by the Confederates in 1861 and were important posts, controlling the eutrance to avenues of approach to the

Central and Southern states. February 6, 1862, General Grant and a land force, assisted by Commodore Foote's river fleet, compelled the surrender of Fort Henry. Most of the garrison escaped to Fort Donelson. Grant advanced upon the latter on the 12th, and began a vigorous bombardment on the 15th, supported on the following day by a bombardment of the fleet. In the night Generals Floyd, Pillow and Forrest, with about 2,000 men, escaped, leaving Buckner in command. On the following morning, Buckner proposed an armistice and requested the terms of surrender. To this Grant made his famous reply, "No terms except unconditional and immediate surrender can be accepted. I propose to move immediately upon your works." Buckner at once surrendered fully 15,000 men and a large quantity of ammunition.

FORTIFICATION, the science of strengthening positions in such a way that they may be defended by a body of men much inferior in number to those by whom they are attacked; and more particularly, the science of strengthening positions so that they may be held against the assault of troops supported by artillery. Fortifications are usually classed as permanent or temporary. *Permanent* fortifications are works required to remain effective for a considerable time, for the purpose of defending important positions and cities, dockyards or arsenals. *Temporary* fortifications are such as are designed merely to throw temporary obstacles in the way of an advancing enemy. Modern scientific fortification had its beginnings in the work of the great French engineer Vauban, who worked under the direction of Louis XIV.

Permanent fortifications are constructed on the principle that each part must support and must be supported by some other part; that the works must protect the defenders from the enemy's fire as well as possible, and that the fire of the fortress must completely sweep all parts of the area in front of the fortified lines. Permanent fortifications are now constructed of steel and great walls of concrete. There were numerous forts in Europe early in 1914 that were believed capable of resisting any effort of an enemy, however strong in offensive machinery, to reduce them. In August of the same year it was known that no fort existed which could withstand the greatest guns of a strong military power. The event which forced this conviction upon the world was the attack of the Germans in the first month of the World War upon the supposedly impregnable fortresses of Liege, in Belgium.

Temporary, or field, fortifications vary much, according to the time allowed for construction and the length of time during which they may prove useful. Most important of such fortifications are the elaborate trench systems which were employed in the World War. Carrying the trench system to its logical development, great steel and concrete dug-outs were built thirty to forty feet underground. These latter offered safety from any kind of gunfire, and could be taken only by intrepid raiding parties. The trenches were narrow ditches extending downward about eight feet; they gave temporary shelter from light gunfire. A very shallow trench, with the earth thrown to the front, so as to afford shelter to one man lying in it, may be made in somewhat less than half an hour; more elaborate forms require more time. By placing a man at every four feet, active troops can make a fair shelter for themselves in an hour.

To impede the enemy's advance, an abatis of felled trees may be used, also wire entanglements. Barbed wire stretched in many lengths in front of defenders' positions comprises an element of safety against surprise attack. If the enemy endeavors to cut such wires there is a possibility of discovery and therefore of prompt measures towards defense.

FORT MAD'ISON, Iowa, the county seat of Lee County, eighteen miles southwest of Burlington, on the Mississippi River and on the Atchison, Topeka & Santa Fé and the Chicago, Burlington & Quincy railroads. The city has pork-packing establishments, railroad shops, flour and lumber mills and manufactures of agricultural implements, ice machines, automobile tires, shoes and other articles. Here is the state penitentiary and the Catermole Memorial Library. The Santa Fé Railroad has a hospital here, and there is also Sacred Heart Hospital. A Federal building was erected in 1913 at a cost of $75,000. A later important structure is the German-American bank building (1916). Fort Madison was settled on the site of a fort which had been built in 1808. Population, 1910, 8,900; in 1920, 12,066, a gain of 36 per cent.

FORT MIMS, Massacre of, a massacre perpetrated during the Creek War at Fort Mims, near Mobile, Ala., Aug. 30, 1813. The garrison, including about 550 men, women and children, was surprised by a greatly superior force of Indians under Wethersford, a half-breed. All except fifteen were killed.

FORT MONROE′ or **FORTRESS MONROE,** a military post of the United States, at Old Point Comfort, Elizabeth City County, Va., at the entrance of Hampton Roads. It is on a reservation of about 300 acres, and is the headquarters of the Chesapeake Bay coast defense. Hampton Roads is the headquarters of the Atlantic fleet of the United States navy. Fortress Monroe was important during the Civil War; here Jefferson Davis was imprisoned.

FORT MOULTRIE, *mole′tre,* a fort on Sullivan's Island, at the entrance to the harbor of Charleston, S. C. Early in the Revolutionary War a force of British regulars under Sir Henry Clinton and a fleet under Sir Peter Parker proceeded to Charleston with the view of using the city as a base of operations for the isolation of the Southern colonies. Upon arrival they were confronted by a force of 6,500 Americans, about 450 of whom were under Colonel William Moultrie and were stationed in a fort known as Fort Sullivan, on Sullivan's Island. Parker opened fire upon the fortress; but after a contest of more than ten hours the British were forced to withdraw and to abandon temporarily the invasion of the South. The name of the fort was later changed to Fort Moultrie. It surrendered to the British, May 7, 1780.

A United States garrison occupied Fort Moultrie at the opening of the Civil War, but on December 26, 1860, Major Anderson removed the troops to Fort Sumter, which was better prepared to withstand a bombardment. The South Carolina militia thereupon took possession of Fort Moultrie and used it in the defense of Charleston.

FORT NIAG′ARA, a fort on the American side of the Niagara River, near its mouth, upon the site of a trading post built by La Salle about 1669. In 1725 a Frenchman, Vaudreuil, built Fort Niagara, which became the most important military station and the greatest trading center of inland America. It was attacked during the French and Indian War by a British expedition, and was captured by another expedition in 1759. It was the center of British influence among the Indians during the Revolution, and many expeditions against the frontier were directed from this point. It was evacuated by the British in August, 1796, and was immediately occupied by the Americans. During the War of 1812 it was bombarded and was captured by the British December 19, 1813, but was again surrendered after the close of the war. The United States garrison was withdrawn in 1826.

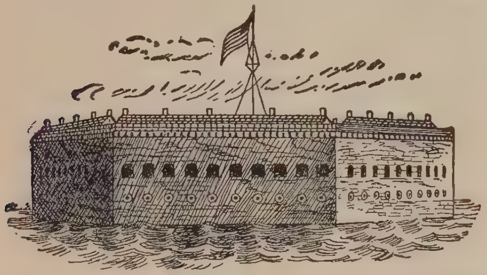
FORTRESS MONROE. See Fort Monroe.

FORT SCOTT, Kan., founded in 1843, is the county seat of Bourbon County, 100 miles south of Kansas City, on the Marmaton River and on the Missouri Pacific, the Missouri, Kansas & Texas and the Saint Louis & San Francisco railroads. The city has foundries, machine shops, flour mills, a syrup factory which is the largest of its kind in the United States, an overall factory and grain elevators. The city is in a region having deposits of coal, flagstone, cement rocks, mineral paints, zinc and lead. It supports a public library and Mercy Hospital. There is a fine Federal building, and near the town is a national cemetery. Fort Scott became a city in 1860; the commission form of government was adopted in 1914. Population, 1910, 10,463; in 1920, 10,693, a gain of 2 per cent.

FORT SMITH, Ark., one of the county seats of Sebastian County, at the junction of the Arkansas and Poteau rivers, on the Saint Louis & San Francisco, the Missouri Pacific, the Arkansas Central, the Kansas City Southern, the Fort Smith & Western and the Saint Louis, Iron Mountain & Southern railroads. The city has sawmills and cottonseed-oil mills and extensive manufactures of furniture, wagons and refrigerators. It has a large trade in coal, cotton, lumber, live stock and hides. Fort Smith was settled in 1838 and was chartered as a city in 1886. There are numerous costly business buildings, a Carnegie Library, an academy, a normal school, three hospitals and a fine union railroad station. The commission form of government was adopted in 1913. Population, 1910, 23,975; in 1920, 28,811, a gain of 20 per cent.

FORT SUMTER (named after Thomas Sumter, a leader in the Revolutionary War), a fort at the entrance to Charleston Harbor,

S. C. When South Carolina seceded in December, 1860, Major Anderson, who commanded the defenses in the harbor, abandoned the other forts and occupied Fort Sumter, with a garrison of eighty men. On April 12, 1861, after unsuccessful negotiations between Anderson, the South Carolina authorities and the government at Washington, General Beauregard opened fire on the fort, which surrendered on the 14th of the same month. This was the beginning of the Civil War. The Confederates greatly strengthened the fort, and it resisted several attacks, but was evacuated in February, 1863.



FORT SUMTER—BEFORE THE CIVIL WAR

On April 14, 1865, Major (then General) Anderson raised the same United States flag over the fort that he had lowered exactly four years before. It has been rebuilt on a modified plan.

FORTU′NA, in classical mythology the goddess of chance. In Greece she was called Tyche, and Hellenic poets and sculptors represented her with a cornucopia, a symbol of prosperity. She differed from Destiny, or Fate, in so far that she gave and took away at her own pleasure and without regard to law. She was the "bringer of good and evil fortune," and was long zealously worshipped. There were temples to her in all parts of Greece and Rome, after the reign of Servius Tullius, with whom her vogue originated.

FORTUNA

FORT WAYNE, Ind., one of the important cities of the state, 150 miles nearly east of Chicago, on Saint Joseph and Saint Mary's rivers, which here join and form the Maumee, and on the New York Central, the Pennsylvania, the Grand Rapids & Indiana, the New York, Chicago & Saint Louis, the Wabash, the Cincinnati, Hamilton & Dayton and the Fort Wayne, Cincinnati & Louisville railroads.

The most striking architectural feature of the city is a courthouse that cost over $1,000,000, situated in the heart of the business district; there is also a fine Federal building. Here is located the Indiana School for Feeble-Minded Youth; other institutions are a Carnegie Library, the building for which cost $90,000, three hospitals, a fine high-school building and two orphan asylums. In the city are monuments to "Mad Anthony" Wayne and General Henry W. Lawton. Concordia College (Lutheran) has been located here since 1839.

Two of the railroads have repair shops here; there are foundries and machine shops, a knitting mill, several packing houses, and chemical, soap, piano, shirt and waist factories. These are among the most important of several hundred industrial enterprises. The city is governed under a special charter granted by the legislature. Population, 1910, 63,933; in 1920, 86,549.

FORT WILLIAM, a city of Ontario, situated on the northern shore of Lake Superior and on the main lines of the Grand Trunk Pacific, Canadian Pacific and Canadian Northern railways, 861 miles from Winnipeg. The first settlement was made by French traders in 1669. Its railways and excellent harbor at the head of Great Lakes navigation give the city great commercial importance, and it is one of the largest traffic centers of Canada.

About 3,000 vessels, with an aggregate tonnage of 8,000,000, enter and clear from its docks annually. The grain elevators have a total capacity of 22,000,000 bushels. The chief manufactures consist of flour, oatmeal, iron pipe, car wheels, tinware, brick, tile, brooms, wire nails, hardwood finishings, lumber, cigars, cheese, harness and aerated waters. In the vicinity are iron, copper and silver mines, blast furnaces and pulp mills. The city has fifteen churches and a public library, and it owns nearly thirty miles of street railways. Population, 1911, 16,499.

FORT WORTH, Tex., the fourth city in size in the state and the county seat of Tarrant County, thirty miles west of Dallas, on the Trinity River and on twelve main lines of railroad. The most important of these are the Chicago, Rock Island & Pacific, the Texas & Pacific, the Fort Worth & Denver City, the International & Great Northern, the Gulf, Colorado & Santa Fé, the Saint Louis Southwestern, the Saint Louis & San Francisco, the Missouri, Kansas & Texas.

The city is in a vast stock-raising country and is an important cotton market. The principal industries include packing houses, flour mills, tanneries, railroad shops, foundries, cotton mills and other factories. It is the seat of Fort Worth University, Polytechnic College, Saint Ignatius Academy, Fort Worth Medical College, an academy of music, a kindergarten training school, Saint Andrews School, the Texas Masonic Normal Training School and four business colleges. There is a Carnegie Library; there are two public hospitals and four that are private, and the city has six sanitariums. Fort Worth was settled in 1849 and was incorporated in 1872. In 1907 the commission form of government was adopted. In 1909 a great fire destroyed ten blocks in the center of the city, but the devasted area was at once rebuilt. Population, 1910, 73,312; in 1920, 106,482, a gain of 45 per cent.

FO'RUM, among the Romans, any open place where the markets and courts of justice were held. There were a number of such places in Rome, the most celebrated, by far, being the great Roman Forum, between Mount Palatine and the Capitoline Hill, which formed the political and commercial center of the city. Surrounding this were the temples of Saturn and of Concord, the Basilica Porcia, the first courthouse, built in 184 B. C., and many other beautiful buildings. Though this Forum escaped the devastations of the fifth century, it became almost a waste in the Middle Ages, but of late years the government has made clearances and excavations and has taken charge of the valuable relics which are left. In legal phrase, *forum* signifies the court or place where an action is instituted.

(For location of the Roman Forum, see full-page illustration Rome, the Eternal City, in article Rome.)

FOS'SIL. Fossils are petrified forms of plants and animals, found in the rock formations of the earth. Most of them represent species that have long since been extinct, and their study is of the greatest importance to the geologist, since they reveal to him the forms and conditions of life at different periods in the world's history. From the study of fossils we know that the simplest forms of life are those which first appeared, and that all life can be traced to one-celled organisms.

From these simple forms both vegetable and animal life increased in complexity and importance as conditions for the existence of higher orders appeared. The animal fossils are more easily traced than the plant fossils. A study of these shows that no vertebrate animals appeared before the Silurian period, and during the latter part of this and the Devonian period the fishes reached their highest development. These were followed by the reptiles, which in turn were followed by birds, and these by the mammals, which were the progenitors of existing species. The study of fossils also shows that each period in the world's history has been characterized by some special form of life, which at that time reached its highest development; thus, the fishes distinguish the Devonian age, and the reptiles, the age that followed. A study of the fossils of plants shows the same progress from the simplest forms to existing species. Fossil study is known scientifically as paleontology. See GEOLOGY.

FOSTER, GEORGE EULAS, Sir (1847–), a Canadian statesman, born at Carleton, New Brunswick, and graduated from University of New Brunswick in 1868. From 1871 to 1879 he was professor of ancient literature in his alma mater. He was elected to the Dominion House of Commons in 1882. He early won recognition as a brilliant thinker and speaker, and in 1885 was appointed Minister of Marine and Fisheries in the Macdonald Cabinet. In 1888 he became Minister of Finance, holding office till the retirement of the Conservatives in 1896. On the return of the Conservatives to power in 1911 he was appointed Minister of Trade and Commerce. He was knighted in 1914.

FOSTER, STEPHEN COLLINS (1826–1864), a song writer, born near Pittsburgh, Pa. Without any formal training in music, Foster composed more than one hundred and seventy-five songs, usually both words and music. For *The Swanee River* he is said to have received only five hundred dollars. The most popular of his other songs are *My Old Kentucky Home*, *Nellie Was a Lady* and *Massa's in the Cold, Cold Ground.*

FOSTORIA, Ohio, a city in Seneca and Hancock counties, thirty-five miles southeast of Toledo, on the Baltimore & Ohio, the Lake Erie & Western, the Hocking Valley, the New York, Chicago & Saint Louis and the Toledo & Ohio Central railroads. There is interurban service also. It has flour and planing mills, brass and iron works and manufactories of glass, carriages, electro-carbons, automobiles and other articles. It is in a fertile farming region and is near the oil fields. The city was settled by the father of Charles Foster, who became a governor of Ohio and Secretary of the Treasury. Population, 1910, 9,597; in 1920, 9,987, a gain of 4 per cent.

FOUCAULT, *foo ko′,* Jean Bernard Leon (1819–1868), a French physicist. His name is especially connected with a celebrated pendulum experiment, employed as a method of showing the rotation of the earth on its axis. He also made important discoveries in optics, electric lighting and photography and invented the gyroscope and the polarizing prism which bears his name.

FOUNDING, the art of casting iron, steel, brass and some other metals into various shapes. The place where castings are made is called the *foundry.* The process of making iron castings practically illustrates that of all other metals. A pattern of the article is first made of wood, aluminum or brass; the latter two are increasingly popular, but most patterns are of wood. The pattern, if of wood, is a little larger than the object, to allow for shrinkage, and is so constructed that it can be taken from the mold in parts if necessary. The mold is usually a box in two parts. The pattern is set in one part, and molding sand, which is a sand of very fine grain, is tightly packed around it. The other part of the mold is then added, and the process of packing the pattern is completed. When this is done, the mold can be opened and the pattern removed without disturbing the sand, thus leaving a perfect mold of the article to be cast. Holes for pouring in the metal are cut through the sand. The iron is melted in a furnace, called a *cupola,* which is a cylindrical iron furnace, lined with fire brick. It has tuyeres, or small pipes, near the bottom, through which the blast enters (see Iron; Steel).

The melted iron is poured into ladles, from which it is poured directly into the molds. Complicated castings require patterns in several parts and call for great skill in molding.

FOUNTAIN, a natural spring of water; also an artificial basin containing water for drinking or such a basin connected with an arrangement of pipes through which water flows in ornamental jets. The operation of fountains is based on the following principle: If water confined in a pipe or crevice is under heavy pressure from one end, it will, if released from the other end, gush out with a force corresponding to that pressure. Water piped from a mountain lake to a valley will rise to a height nearly level with its source, being under pressure of gravity.

The Greeks and Romans had many fountains of the gravity type, and remains of them are numerous among their ruins. Their fountains were designed to ornament public parks and squares and to supply the people with water for household purposes. The fountains in modern cities are produced by pumps operated by machinery, that is to say, those which furnish the regular water supply. One of the most beautiful of modern municipal fountains is the bronze *Tyler-Davidson* fountain at Cincinnati, Ohio (see Cincinnati). Another is the very handsome *Spirit of the Great Lakes,* designed by Lorado Taft. Its five bronze female figures, each with a large shell-basin from which she pours water into a basin below, typify the five Great Lakes. This fountain stands in Grant Park, Chicago. Among the most famous fountains of Europe are the Schöne Brunnen, at Nuremberg, Germany; the Fontana Maggiore, at Perugia, Italy; the Fontaine des Innocents, in Paris, and the fountains and cascades at Versailles and Saint Cloud, in France, and the Alameda Fountain, at Malaga, Spain.

Some of the most famous fountains of recent date have been constructed for great expositions. Among these are the *Fountain of the Republic,* by Macmonnies, at the World's Columbian Exposition in Chicago in 1893; the fountains of *Man, Nature* and *Progress,* at the Pan-American Exposition in Buffalo in 1901, and the *Cascades,* at the Louisiana Purchase Exposition at Saint Louis in 1904; and the *Fountain of the Earth,* by Robert Aitken, and *The Fountain of Energy,* designed for the Panama-Pacific Exposition in 1915.

FOUNTAIN OF YOUTH. It was the belief of many people in medieval and early modern times that somewhere there existed a fountain that would bring back youth to the aged, if they could but drink of its waters. It was the search for this miraculous fountain that brought Ponce de Leon and his followers and possibly other Spanish explorers to America.

FOUR-O'CLOCK, an old-fashioned and common plant, first known in South America, so called because its blossoms open late in the afternoon. The plant is bushy and grows to a height of about two feet. The blossoms grow on the ends of the branches, and flowerets of different colors often grow on the same branch. They stay open all night and close in the morning, never to open again. The plant is a steady bloomer from early summer until the months of frost.

FOURTH OF JULY. See INDEPENDENCE DAY.

FOWL, a word originally synonymous with *bird,* now used in a stricter sense to designate a family of birds of which the common domestic fowls, the cock and hen, are familiar examples. The general form and characters of the bill and feet agree with those of the pheasants, but the crown of the head is generally naked and is furnished with a fleshy comb; the base of the lower mandibles also bears fleshy lobes, or wattles, which are most conspicuous in the males. The legs of the male are furnished with spurs, which are much used in conflict, the cocks being particularly quarrelsome and unable to suffer the presence of a rival. In the center of the cock's tail are two long feathers, which fall backward in a graceful arch and add great beauty to the whole aspect of the fowl. Except in the pure white breeds, the plumage of the cock is always more splendid than that of the hen. All the species are natives of the East Indies and the Malay Archipelago. See PHEASANT; POULTRY.

FOX, an animal belonging to the same family as the dog and the wolf. It is one of the smaller members of the family, and is famed for its cunning. From this trait has come the term, applied to a person, whether complimentary or otherwise, that he is "as sly as a fox." The stories told of the animal's intelligence in eluding its enemies, in protecting its young and in securing its food are sometimes so strange as to be almost beyond belief. The fox is a native of almost every part of the globe and is everywhere known as the most wily of beasts of prey. It has a straight, bushy tail, erect ears and is extremely alert and avaricious, devouring birds and small quadrupeds, fruits, honey and eggs. The fox's home is a dry burrow or hole in the rock, and usually consists of an outer hole, or room, where the fox lies, a store room, where he keeps his food, and behind all, his sleeping room and the place where his family lives. When the fox is captured he will sometimes feign death and will endure the roughest treatment without flinching.

RED FOX

Besides the common fox of Europe and Asia, there are the *blue fox* of the Aleutian and other Arctic islands, notable for its beautiful bluish fur, one of the most valuable furs in the market; the *black fox,* a native of the northern parts of Asia and America, similar to the common fox, but distinguishable by its rich, shiny, black fur; the *gray fox,* once very common through the northern parts of America, characterized by the thick tail, at the tip of which is a tuft of stiff hairs; the *red fox,* of America, generally of a pale yellow color, but in the winter almost pure white, especially in the Arctic regions; the *crossed fox,* whose fur is gray on the upper parts and black beneath and on the muzzle, with a dark cross over the shoulders, and the *swift fox,* a former inhabitant of the western American plain.

The *silver-black* fox has become of great economic importance because of the beauty of its fur. The story of the growth of the industry of raising these foxes for their valuable pelts is told in the article FUR FARMING.

FOX, a tribe of Indians belonging to the Algonquian family, now scattered over Oklahoma, Iowa, Kansas and Nebraska. They called themselves *Meshkwakihug,* or *Red Earth People,* the name Fox having been applied by the French. In 1760 the tribe united with the Sac Indians (see SAC). They now number about 700.

FOX, Charles James (1749–1806), an eminent English statesman and orator. From his first election to Parliament in 1768 he was recognized as a man of promise. He was a member of North's ministry from 1770 to 1773 and of Rockingham's in 1782. He was a close friend of Burke and was one of the chief opponents of the war with America, the outcome of which he clearly foresaw. As an admirer of Napoleon and an opponent of the war with France, Fox was the great rival of Pitt. Among orators, Fox was of the first class, although in eloquence and brilliancy he did not perhaps equal Pitt, Burke and Sheridan. His private life was marred by vices, but these he never allowed to interfere with the performance of his public duties.

FOX, George (1624–1691), the founder of the Society of Friends, or Quakers, was born at Drayton, in Leicestershire, England. In his youth he was apprenticed to a shoemaker, but he soon began to wander from place to place, preaching and otherwise laboring for religious reforms. He went on many missionary journeys to Iceland, Scotland, Holland and North America—and made numerous converts. He declared that the source of divine truth was not the Scriptures, but the Spirit of God. For this opinion he was frequently imprisoned, but continued to gain followers. These were first denominated *Quakers,* in consequence of their trembling mode of delivery and their calls on the magistrates to "tremble before the Lord."

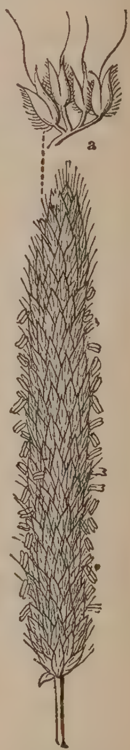
FOX, John, Jr. (1863–1920), an American novelist, born in Kentucky, and in 1883 graduated from Harvard University. Many of his novels deal with mountaineer life of the Southern states. His best known books are *The Heart of the Hills, The Little Shepherd of Kingdom Come, A Mountain Europa, Following the Sun Flag, The Kentuckians* and *The Trail of the Lonesome Pine,* the last successful also in dramatized form. In 1921 appeared *Erskine Dale, Pioneer,* a posthumous novel. In 1908 Mr. Fox married the actress Fritzi Scheff, who divorced him.

FOX′GLOVE, a beautiful flowering plant bearing thimble-shaped flowers, arranged in crowded clusters on a spike. Its leaves and stems are the source of a bitter drug called *digitalis,* which is the Latin name of the plant. This word means *finger,* and refers to the peculiar shape of the rose, lilac, yellow or white flowers. Digitalis is used as a stimulant for weak heart action, but is dangerous if taken in large doses. The foxglove is native to Europe, and is now found in various parts of America.

FOXHOUND

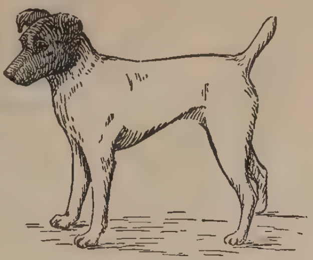
FOX′HOUND, a high-spirited hound that has a keen scent, remarkable perseverance and great endurance. It is easily trained and becomes very skilful in hunting foxes. Somewhat smaller than the staghound, the foxhound seems to be a cross between the staghound or the bloodhound and the greyhound. It is commonly of a white color, with patches of black and tan, has short hair, large and straight limbs and large, thin ears. Its usual height is about twenty inches.

FOX′TAIL GRASS, the common name given to certain grasses, because of the shape of the large clusters in which the flowers are arranged (see illustration). The meadow foxtail grass is an abundant natural grass in meadows and pastures and is an excellent fodder plant. Other species, however, are dry and harsh, not only valueless, but sometimes troublesome weeds, especially in clover fields.



FOXTAIL GRASS
a, spirelet in bloom

FOX TER′RIER, a small dog with long, flat and rather narrow head, strong jaws and small V-shaped ears. It has become almost universally a household pet, especially in America, Canada and England. The nose is black, the eyes small and the body strong. The color is usually white, with black or tan markings. The fox terrier was formerly used to drive foxes from their holes, hence the name. These dogs live about fifteen years, and their weight averages twenty pounds. The illustration is that of the more popular smooth-coated terrier; some have hair that is hard and wiry. See DOG.


FOX TERRIER

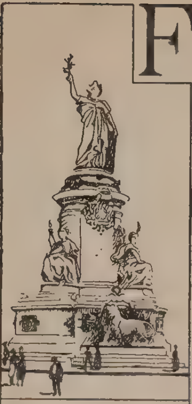
FRACTION, in arithmetic and algebra, one or more of several equal parts into which a whole number is divided; also the written expression of this quantity.

For a discussion of fractions in arithmetic, see the article Arithmetic, subtitle Fifth Year.

FRA DIAVOLO, *frah de ah′vɔ lo*, (Italian, "brother devil") (1770?–1806), a famous Italian brigand, born in Calabria. His real name was Michele Pezza. He was originally a monk. Collecting a band of outlaws, he retired to the mountains, where he attacked and robbed travelers, treating them with the greatest cruelty. He assisted Ferdinand of Naples against the French, but was afterwards detected in fomenting rebellion and was seized and executed. Auber's opera *Fra Diavolo* is founded upon the traditions connected with the name of Pezza, but it has little true historical setting. Its popularity lies in its exquisite music.

FRANC, a modern silver coin and money of account, which since 1795 has formed the unit of the French monetary system and has also been adopted as the unit of coinage by Switzerland and Belgium. The Belgian word is spelled *frank*. Its value is 19.3 cents in United States money and about 9½ pence in English money. It is divided into 10 *decimes* and 100 *centimes*. One of the most common coins in France is the *sou*, equivalent to 5 centimes, or about one cent, in American or Canadian money. Other coins are the 2-franc, 5-franc, 20-centime and 50-centime pieces, in silver, and the 5-franc, 10-franc, 20-franc (the Napoleon), 50-franc and 100-franc pieces, in gold.

In Italy the equivalent coin is the lira; in Greece, the drachma; in Finland, the marc; in Spain, the peseta; in Rumania, the lei.


Statue of the Republic

FRANCE, a republic in the west-central part of Europe, the first one of the great powers of that continent to abolish permanently its monarchical form of government. There is a well-known saying, sometimes accredited to Victor Hugo, that every man loves two countries, his own and France. A basis of truth underlies this statement. "The people of Shakespeare's 'dear, dear land' have made every nation and race their debtors," writes a modern observer; "France has put the beautiful into the life of the common people, into the clothes they wear, into the books they read, until the beautiful, that was once concentrated in palaces, is now diffused through the comforts and conveniences of common life," says another lover of the republic.

When, at the close of the Franco-German War (1871) France found itself facing the loss of two of its richest provinces and the payment of a huge indemnity, the unfortunate nation had the respect and sympathy of the whole world. That kindly feeling deepened as the other nations saw the resolute way in which the French people paid the indemnity, and proceeded to work out the many problems connected with the change in government. The Third Republic, then established, has endured and won friends the world over, and it did not look in vain for help when the great war of 1914 threatened its very existence.

In that life and death struggle France suffered cruelly, and bore the heaviest blows delivered by a relentless enemy. Though but one-ninth of its territory was conquered, that portion represented the heart of its industrial life. It supplied the greater part of the nation's wool, flax, iron ore, pig iron, steel and coal. The war destroyed seventy per cent of the factories of the country, and 450,000 private homes, besides scores of towns and cities, and beautiful structures—cathedrals, libraries, administrative buildings and other public edifices. When the terrible loss in life, health and vitality is also counted, one can appreciate the magnitude of the reconstruction problem of France for years to come.

Location and Size. France is the most westerly country of Central Europe, and lies in about the same latitude as Maine. It has about 2,000 miles of coast line, with the Mediterranean Sea touching it on the south, the Bay of Biscay and Atlantic Ocean on the west, and the English Channel and Strait of Dover on the northwest. Along the greater part of the southern boundary of France rise the summits of the Pyrenees, a strong barrier between it and Spain. Belgium bounds the country on the northeast, and on the east lie Germany, Luxembourg, Switzerland and Italy. Several mountain ranges extend along the eastern boundary, and France is thus shut in for the most part by sea or highlands.

At the outbreak of the World War the country was surpassed in size in Europe by Russia, Austria-Hungary and Germany. With an area of 207,054 square miles, it was less than one-third as large as the Canadian province of Quebec, which to-day is peopled by the descendants of the first French explorers in the New World. The area of the island of Corsica, 3,367 square miles, is included in the above estimate. As the war ended unfavorably for Germany, France asked for the return of its lost provinces—Alsace and Lorraine—and there was no opposition to this proposal among the victorious allies. Accordingly, the peace treaty (May, 1919) declared the two provinces to be again French; stated that Germans who chose to remain there might in three years become French citizens, if they so desired; the railways were given to France, and the public debt was cancelled. This determination added 5,600 square miles to French territory, giving the republic a total area of 212,654 square miles. In addition, France was given possession of the Saar coal region, adjoining Alsace-Lorraine, for fifteen years, as compensation for loss of coal mines suffered through German occupation of Northern France during the war. In 1934 the people of the Saar region will vote upon the question of national sovereignty—whether the district shall revert to Germany or remain French.

The People. The distinctive characteristics of the French people show the effects of the intermingling of various races. The inhabitants of the northwestern part of France exhibit strong Teutonic characteristics. They are tall of statue and have light hair and light complexion, while those of the southern and southwestern portion of the country exhibit equally strong Latin traits. They are usually short of stature, have dark hair and eyes and dark skins. There is no marked line of separation between these two classes, since through intermarriage types having characteristics between the two are frequently formed. In the French people as a race there is exhibited the vivacity and quickness of the Southern temperament, and the stability, industry and thrift that are especially associated with Teutonic blood. Their great men are noted for intellectual brilliance and versatility. It is a common thing for their statesmen to be dramatists, novelists and poets, and their great writers to be distinguished in many different fields. The idea somewhat prevalent before the war that the French are a frivolous and unstable people was quickly overborne by their heroic endurance under supreme disasters. Their fondness for laughter and beauty and their zest for life make them lovable and interesting; underneath it all is a strength of character and devotion to duty that is wholly admirable.

The French language prevails throughout the country, but in the north, especially in the departments bordering on Belgium, Flemish is spoken to some extent, while in the southeast Italian is quite common. See French Language.

At the census of 1911 the population was 39,601,509; according to statistics, during the war the population was decreased four million. At the outbreak of hostilities there were 191.19 persons to the square mile. For a number of years the birthrate in France has been so low as to cause the government serious concern. By the census of 1921, including the restored provinces, the population was 39,209,766.

Education. Public and private education in France is under the direction of the Minister of Instruction, who is assisted by government educational bureaus and inspectors-general. The system of instruction in France is highly organized and centralized. Education is free and compulsory between the ages of five and thirteen, and in all grades the boys and girls meet in separate classes. Secondary education is provided for in state colleges, or lycées, private schools and communal colleges, these latter being supported by the communes (see subhead *Government and Religion*).

The majority of the girls who are educated in the higher branches attend convent schools, but the boys usually go to the secular schools, since certificates from these schools are necessary to qualify applicants for certain professional and government positions. For those who desire instruction beyond that provided by the state there are universities, special schools and private instructors. The leading university, that of Paris, has an enrollment of over 17,000 in peace times. The entire country is divided into seventeen great administrative districts, each of which has its own officials; each is further subdivided.

Government and Religion. The government is republican in form. The chief executive is a President, elected by the two houses of the national legislature for a term of seven years. He is eligible for reëlection. The legislative department consists of the Chamber of Deputies and the Senate. The Chamber comprises members elected by universal suffrage for four years, and apportioned among the arrondissements (counties). In 1918 there were 602 deputies. The senate is composed of 300 members, chosen by direct election for nine years. The colonies are represented in the chambers. The President is assisted by a Ministry, the members of which preside over the several departments of government. As in Great Britain, the Ministers are responsible to the national legislature, and go out of office when defeated.

For the purpose of local administration the country is divided into eighty-seven departments. Each department is governed by a prefect, who is appointed by the President and is assisted by a council composed of a number of members equal to the number of cantons. Each department is subdivided into arrondissements, there being four to a department. The arrondissement is again subdivided into eight cantons, and the cantons, are subdivided into communes, the commune being the smallest unit for local government. Each commune comprises a town or a part of a town or one or more villages and is governed by a mayor, who is appointed by the government, and a municipal council, which is elected by the inhabitants. The peculiarity of the French government lies in the direct connection of national government with all local government. Through appointments every officer is practically responsible to the heads of departments, and through them to the President.

The judicial system embraces a series of courts, at the head of which is the Court of Cassation at Paris, consisting of a president, three presidents of sections and forty-five judges, or counselors. Below this are twenty-six courts of appeal, each having jurisdiction over several departments. These courts are engaged entirely with cases appealed from the courts in the arrondissements, known as courts of first instance, and below these are the justice courts of the cantons and communes.

By far the larger part of the inhabitants profess the Roman Catholic faith, and until recently there was a close connection between Church and State, but in 1906 this was completely dissolved. All religious beliefs have equal standing before the government, and all beliefs are tolerated.

Surface and Drainage. The larger part of the country is comparatively low and level. The highest lands are in the south and southeast. The Pyrenees form an unbroken boundary between France and Spain and have an average height of about 9,000 feet, but the highest peaks reach an altitude of nearly 10,500 feet. The eastern boundary of the country is formed by the Alps in the south, the Jura Mountains in the center and the Vosges Mountains in the north. The Alps attain their highest altitudes in this boundary line, where Mont Blanc, which is almost wholly in France, reaches a height of 15,780 feet. Other important peaks on this range are Mont Cenis, to the south, noted for its celebrated pass, and for the railway tunnel which forms connection with Italy; Mont Genevre, and Mont Viso. All of these are of sufficient altitude to give them prominence in a range of mountains noted for the grandeur of its scenery.

West of the Alps and running almost parallel to them are the Cevennes, a range of low mountains which extends almost from the southern to the northern boundary and forms the great watershed separating the valleys of the Rhine and Rhone from the rivers which flow into the Bay of Biscay and the English Channel. In the south-central portion of the country are the mountains of Auvergne, a series of low volcanic peaks, situated upon the central plateau. All of the northern and western portion of the country is a part of the great Asiatic plain, which finds its western terminus here and in the southern part of Great Britain. The general slope of this plain is to the north and west, and it occupies fully four-fifths of the entire country.

The spurs thrown off by the great watershed divide France into seven principal river basins, six of which are on the northwestern slope and one on the southeastern. These are (1) the basin of the Garonne and its affluents; (2) the basin of the Loire and its tributaries, the Nièvre and Maine on the right, the Allier, Loiret, Cher, Indre, Vienne and Sèvre Nantaise on the left; (3) the basin of the Seine and its tributaries, the Aude, Marne and Oise on the right, the Yonne and Eure on the left; (4) the basin of the Meuse, with its affluent, the Sambre; (5) the basin of the Escaut, or Scheldt, with its affluent, the Scarpe; (6) the basin which pours a number of tributaries, the principal of which is the Moselle, into the Rhine; (7) the basin of the Rhone, occupying the whole of the territory which lies to the southeast of the great watershed, the tributaries being the Ain, Saône, Ardèche and Gard on the right, and the Isère, Drôme and Durance on the left. The four great rivers of France are the Loire, the Seine, the Rhone and the Garonne. France has in all more than 200 navigable streams, with a total navigation of about 5,500 miles. Lakes are few and small.

Climate. The climate of France is characterized by its mild and even temperature throughout all of the lowland region, and by its continental features in the mountainous regions of the interior. In general along the coast the climate is remarkably warm and even for the latitude. This is due largely to the warm winds blowing over the Atlantic, which prevail during the greater part of the year. The high altitudes in the mountainous regions are cooler, and in the Alpine region the climate exhibits a marked contrast between winter and summer. The southeastern section, bordering on the Mediterranean, has a semitropical climate, and here the olive, the orange and other semitropical fruits and plants flourish. The prevailing winds over this portion come from the Mediterranean, and it is due to this fact that this section maintains its high and even temperature. The rainfall varies considerably in different parts of the country. In the mountainous regions of the Pyrenees, the Cevennes and the Alps it usually exceeds forty inches. Throughout the country as a whole the average is about thirty inches. With the exception of a small area in the northern plains, where the annual rainfall is only about ten inches, there is everywhere an abundance of moisture for agricultural purposes.

Mineral Resources. Exclusive of Alsace and Lorraine, the country has two valuable coal areas—that of Valenciennes, in the northeast, forming the western extremity of the great Belgian coal field, and that of Saint Etienne, in the southeast, to which the manufactures of Lyons and the surrounding districts are indebted for much of their prosperity. The northeastern coal lands were captured early in the war, and they were not recovered until late in 1918. The mines in the vicinity of Lens were wrecked by the Germans and required months of repairing work to become reproductive. Though the annual coal output in normal years is more than 40,000,000 tons, this yield falls so far short of the annual consumption that a large quantity is imported from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coal fields contain seams of iron, which are extensively worked and which furnish ore to a great number of blast furnaces; but of the total amount of ore smelted in the country a considerable proportion is imported. Other metals, such as lead, zinc, manganese and copper, are obtained to some extent. Common salt is obtained from mines of rock salt, from salt springs and in still greater quantity from lagoons and salt marshes on the coast. Marble is quarried in the Alps and Pyrenees, granite and other building stone is found in many localities and roofing slate is obtained in large quantities.

Fisheries. The fisheries of France are extensive. The principal fishes of commercial importance are sardines, found on the coast of the Bay of Biscay; herring, mackerel, turbot and salmon, abundant in the English Channel and the North Sea; tunnies and anchovies, found on the shores of the Mediterranean. Oyster breeding is largely engaged in, the most extensive oyster beds being those of the basin of the Arcachon, in the Department of the Gironde. Cod fishing is carried on actively near the Newfoundland banks by French fishermen, and also near Iceland.

Agriculture. About nine-tenths of the soil of France is productive, and about one-half of the whole is under the plow. The cereals forming the great bulk of the cultivated crops are wheat, oats, rye and barley. Wheat is the most important cereal, and, next to Russia, France raises the largest quantity of all European countries. The crops next in importance to these are meslin, or mixed corn, potatoes, hemp, rape, maize, buckwheat, flax and beets. Beets are cultivated extensively in some departments, especially in that of Nord, for the manufacture of sugar. The cultivation of tobacco is monopolized by the government and is confined to certain departments. In France grass land is not abundant and the breeding of cattle is indifferently practiced. The rearing of sheep is more successful, much of the wool being scarcely inferior to merino wool. Excellent horses are bred in the north, and as there is an extensive demand for horses for the army, considerable pains is taken in the government studs to improve the breeds. Asses and mules, generally of a superior description, are much employed.

The cultivation of the vine is one of the most important branches of French agriculture, the total quantity of land in vineyards being nearly a twenty-fifth of the whole surface. In everything relating to this branch of culture, the French are unsurpassed, the various first-class wines which they produce, under the names of Champagne, Burgundy and Bordeaux, being universally known. It is estimated that in good years France produces about one-half of the wine of the world. Among the most important fruit trees cultivated in France are the apple, especially in Normandy; the chestnut, whose nuts in some of the central districts of France form a staple of food among the poorer classes; the mulberry tree, cultivated in the southeast, both for its fruit and its leaves, the latter furnishing the food of the silkworms so largely reared here (see SILK); the olive, the pear, the plum, the peach, the orange, the citron and the fig. The land is divided into small farms, the largest seldom exceeding fifteen acres. Most of these farms are owned by those who occupy them. Intensive farming is practiced; the utmost skill and latest scientific methods are employed in cultivating the soil, and excellent returns reward the husbandmen.

Manufactures. In those lines of manufacture which require skill and good taste, France has a reputation which is world-wide. From no other country do there come such beautifully made gloves, laces, gauze, small pieces of jewelry, silks, tapestries and china and glass ware. The textile manufactures are the most important line, and include woolen, cotton and silk goods, ranking in the order named. The center of the silk industry is Lyons, which is far south of the war zone. In normal years the textile output is valued at about $750,000,000, and though the mills were greatly demoralized by the war, there was later a gradual recovery, and by 1917 they were running almost as in peace times. The metal industries, which rank second to textiles in normal times, were stimulated by the demands of the war, and showed a great increase. The smaller metal products of the French factories are noted both for excellence of construction and artistic finish. Though France does not manufacture machinery on the same scale as the United States, its automobiles, aeroplanes and field artillery guns are among the finest made anywhere. Flour, macaroni and sugar are other important lines of manufacture. French wines set a standard of excellence for the world.

Transportation and Commerce. France has an extensive and well-managed system of railways. Of the total mileage of about 30,400, over one-fourth is owned by the state, and all other roads are under government regulation. In course of time all of these railways will be government-owned. The railway systems radiate from Paris and can be worked as a unit by means of the *Grand Ceinture,* a strategic railway encircling the capital. This road proved of inestimable service during the war. Valuable construction work was carried on by American engineering companies after the United States entered the struggle.

France has over 7,000 miles of navigable waterway, made up of rivers and canals. These are of great service in relieving congestion on the railroads. Even during the war plans were made to extend the canal system (see CANAL).

In normal years France has an annual foreign trade of nearly $4,000,000,000, the import trade constituting over half. Manufactured products are exported in great quantities, and there are large imports of raw materials.

Literature and Art. See LITERATURE, subhead *French Literature;* PAINTING; SCULPTURE, subhead *France;* ARCHITECTURE.

Colonies. The colonial possessions of

France far exceed in area and population the home country and are distributed as shown by the following table:

France's Colonial Possessions	Area Sq. Miles	Estimated Population
In Asia:		
India	196	265,200
Cochin-China	22,000	3,452,248
Annam	39,758	5,731,189
Cambodia	57,900	2,000,000
Tonking	40,530	6,470,250
Laos	96,500	800,000
Kwang Chan Wan	190	168,000
In Africa:		
Algeria	222,180	5,800,974
Sahara	1,500,000	800,000
Tunis	50,000	2,093,939
Senegal	74,112	1,225,523
French Sudan	617,600	2,474,589
Upper Volta	154,400	2,974,142
Guinea	95,218	1,875,996
Ivory Coast	121,976	1,545,680
Dahomey	42,460	842,243
Mauritania	347,400	261,746
Ter. of Niger	347,400	1,084,043
Congo	982,049	9,000,000
Cameroon	166,489	1,500,000
Réunion	970	174,000
Madagascar	228,000	3,545,264
Mayotte Is.	790	97,000
Somali Coast	5,790	65,000
In America:		
St. Pierre and Miquelon	93	3,918
Guadeloupe	688	229,822
Martinique	385	244,439
Guiana	32,000	49,000
In Oceania:		
New Caledonia	7,650	50,600
Tahiti, etc.	1,520	30,000
Total	5,257,244	54,854,805

*The areas of many of these territories, especially those in Africa, are still in doubt, owing to the fact that the boundaries have never been definitely established. The total area given in this table is in accord with the best authorities.

Army and Navy. See ARMY, subhead *French Army;* NAVY, subhead *French Navy.*

Cities. France has a number of important cities. At the head of these stands Paris, the political and commercial capital of the country and the largest city on the Continent. The other large cities, in the order of their importance, are Marseilles, Lyons, Bordeaux, Lille, Toulouse, Saint-Etienne, Roubaix, Nantes and Havre. Many of the finest manufacturing cities in the northern part of the country were destroyed by the German invasion.

History. France, or Gaul, as it was called by the Romans, was inhabited during the earliest years in which we have any knowledge of it by a number of independent tribes, who appear to have been mainly Celtic in race. In the latter half of the seventh century B. C., the Romans conquered a portion of the southeast, and under Julius Caesar the conquest of all Gaul was completed, between 58 and 51 B. C. During the Roman occupation, the country became completely Romanized in language, civilization and religion, and many flourishing towns sprang up; but in the decline of the Roman Empire various German tribes began to make settlements in the country, especially the Visigoths, the Burgundians and the Franks. It is from these last that the country took its name. Toward the close of the fifth century, Clovis, chief of the Salian Franks, completely overthrew Roman dominion and made himself master, not only of almost all France, but of considerable territory east of the Rhine. The dynasty which he founded is known as the Merovingian.

On the death of Clovis, in 511, his kingdom was divided among his four sons, and a large part of the history of the Franks under the Merovingian kings is the history of the contests between Neustria and Austrasia, the two most important of the states into which the Empire was divided. Pippin of Heristal, mayor of the palace of the Austrasian king, conquered Neustria and thus brought all France under the same sway. He was the real ruler, although there was still a nominal king, as there was during the time of Pippin's son, Charles Martel. Pippin the short, first mayor of the palace under the last of the Merovingian kings, was himself raised to the throne in 751. He was succeeded in his kingdom by his son, Charles the Great. Charlemagne's great empire was a German one, however, and there was as yet, strictly speaking, no kingdom of France.

On the death of Charlemagne's son, Louis the Pious, the empire was divided by the Treaty of Verdun (843) among his sons, Charles the Bald receiving that part which most nearly corresponds to modern France. It is at this time, therefore that the separate history of France may be said to begin.

Charles the Fat, King of Germany, succeeded in 884 in making himself ruler of the Frankish territory also, but he was deposed after three years. After the brief usurpation of Odo, count of Paris, Charles III, the brother of Louis III, was recognized as king. His authority was little more than nominal, as France was divided into a number of great fiefs, the holders of which were practically independent. This circumstance made it impossible for Charles to offer any adequate resistance to the Norman pirates, whom he was obliged to buy off by surrendering to them the territory which took from them the

FRANCE DURING THE MIDDLE AGES

SILVER PENNY OF CHARLEMAGNE

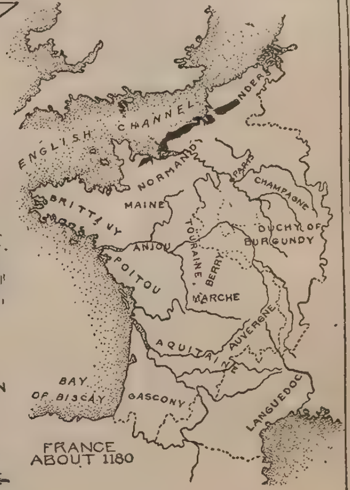
A FRENCH KNIGHT, 13TH CENTURY

JOAN OF ARC
(JEANNE D'ARC)
(From Painting by Nikolaki)

CHARLEMAGNE

AN OLD TOWER AT ROUEN

A MEDIEVAL WINDMILL



FRANCE ABOUT 1180

AGRICULTURE IN THE MIDDLE AGES

STANDARD OF JEANNE D'ARC

CHRONOLOGICAL SUMMARY

Death of Charlemagne	814
Vikings in Saxony	851
Paris Burned by Vikings	857
Charles the Bald	875
Charles the Fat	882
Hugh Capet	987
First Crusade	1096
Second Crusade	1147
Louis IX	1226-1270
Philip the Fair	1285
Hundred Years War	1338
Poitiers	1350
Peace of Bretigny	1360
Murder of Duke of Orleans	1407
Agincourt	1415
Joan of Arc Burned	1431
End of the Middle Ages	1453

H.M Haines

name of Normandy. On the death of Louis V, in 987, Hugh Capet, the son of the most powerful of the great vassals, was raised to the throne, thus becoming the founder of the Capetian dynasty. The fact that the accession of the House of Capet added to the Crown the great fiefs of Paris and Orleans made the central authority somewhat stronger than it had been under the Carolingian kings.

The first great task of the Capetian line was to reconquer the royal prerogatives from the great vassals, but for two centuries they were unsuccessful. Louis the Fat, who came to the throne in 1108, was the first really strong ruler of the line. In his struggles with the nobles he was greatly helped by the fact that the latter had been much weakened by the Crusades and also by the increased power of the towns, who allied themselves with the king.

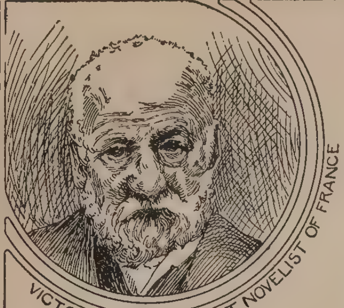
With the death of Charles IV, in 1328, the first branch of the Capetian kings became extinct, and Philip, of the House of Valois, a cousin of Charles IV, came to the throne, according to the Salic Law. The claim of Edward III of England to the throne of France led to a series of wars between the two countries, which lasted for over one hundred years. Under Charles VII, France regained from England all of the territory of France, except Calais. The shrewdness and unscrupulousness of Louis XI (1461–1483) completed the subjugation of the great barons and laid the foundation of absolute monarchy. Maine, Anjou and Provence were left to him by the will of the last count, and a large part of the possessions of the duke of Burgundy came to his hands shortly after the death of Charles the Bold of Burgundy. Louis's son and successor, Charles VIII (1483–1498), united Brittany to the Crown by his marriage with Anne of Brittany. During the reign of Charles VIII occurred the first invasion of Italy by France, which had such important results.

Charles was the last king of the direct line of Valois and was succeeded by Louis XII, of the House of Valois-Orleans. On his death the crown passed to another branch of the House of Valois, the Valois-Angoulême branch, in the person of Francis I (1515–1547). Francis continued the attempts at conquest in Italy and thus came into conflict with Charles V of Germany, who claimed Milan. The results were disastrous for Francis. On the death of Francis, his son, Henry II (1547–1559), came to the throne, and he continued the struggle with Austria. His reign is noteworthy, because during it began the persecution of the Huguenots. Francis II, the husband of Mary Queen of Scots, succeeded his father, Henry, but reigned little more than a year (1559–1560). During his reign and the reigns of his brothers, Charles IX and Henry III, intrigue and corruption gave to women a dangerous influence at court and in public affairs. During the reign of Charles IX, who was entirely under the influence of his mother, Catharine de' Medici, the struggle between Huguenots and Catholics came to a climax in the Massacre of Saint Bartholomew's Day. These religious wars were terminated only when Henry IV of Navarre (1589–1610), the leader of the Huguenots, who became king of France on the death of Henry III, went over to the Catholic Church.

During the minority of Henry's son, Louis XIII, the policy of France was somewhat wavering, until the prime minister, Richelieu, gave it a steady direction. He continued the policy of the former kings who had labored for the humiliation of Austria and relentlessly oppressed the Huguenots. Louis XIII died in 1643, the year after Richelieu, and was succeeded by his son, Louis XIV. Mazarin, during the years of Louis's minority, carried out the policy of Richelieu, and Louis XIV, when he took the rule into his own hand, proved to be a ruler of strong will and steady purpose. The close of this reign in 1715 found the finances in disorder, an enormous national debt imposed upon the country and industries in a depressed condition. Louis XV, the great-grandson of Louis XIV, succeeded him at the age of five years. During his minority, the regent, the Duke of Orleans, squandered the revenues in a most reckless manner, and when Louis himself assumed the authority matters grew worse, rather than better, for he was constantly under the influence of mistresses, by whom he was led into useless and costly wars.

With the reign of Louis XVI began the period of reaction against the oppression which had been practised on the people. The king himself was honest and well-meaning, but the whole administration was corrupt, and the court, the nobility and the clergy formed a privileged class, united to oppress the people. The taxation, which was neces-

FRANCE
From the Consulate to the World War



VICTOR HUGO, GREATEST NOVELIST OF FRANCE

COIN OF YEAR XII 1803-4

EIFFEL TOWER. HEIGHT, 984 FEET

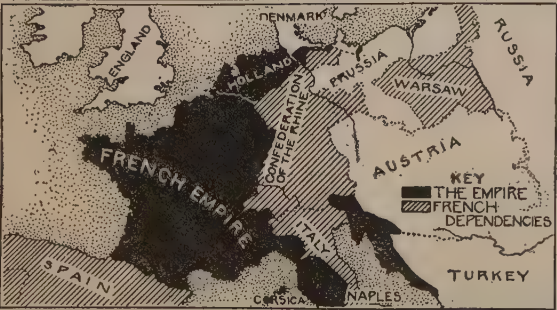
NAPOLEON BONAPARTE

"LIBERTY ENLIGHTENING THE WORLD;" A Gift from the French Republic to the Greatest Republic. Height of Statue, 151 feet; of pedestal, 155 feet.

RAYMOND POINCARÉ, PRESIDENT-1913-1920

NAPOLEON III LAST OF THE EMPERORS

NAPOLEON'S EMPIRE AT ITS GREATEST EXTENT



Chronological Summary	
Napoleon, First Consul	1799
Napoleon Crowned Emperor	1804
Waterloo	1815
Restoration of Louis XVIII	1815
Death of Napoleon I	1821
Revolution of July	1830
The Second Republic	1848
Crimean War	1854
Franco-German War	1870
Third Republic	1870
Universal Exposition, Paris	1900
World War began	1914

IN DEVASTATED FRANCE

sarily heavy, fell upon the peasantry only, leaving the two leisure classes untouched. The good intentions of Louis were neutralized by a total lack of energy and firmness, and he was unable to appreciate the fact that his few concessions could not materially improve a situation which called for the most thorough-going reforms. The great difficulty of his government was the hopeless condition of the public finances, with which Turgot, Necker, Calonne and Brienne in vain attempted to grapple. Finding all ordinary measures unavailing, Necker called for the congregation of the States-General, which had not met since 1614. This body met in May, 1789. In 1799 Napoleon was made first consul, and for the next sixteen years the history of France is virtually the history of Napoleon.

Louis XVIII, who was placed on the throne of France on Napoleon's first abdication in 1814 and was restored in 1815 after the Hundred Days, at first governed with the support of a moderate liberal party. The reactionary spirit of the aristocrats and returned *émigrés* soon, however, came to predominate. Louis died in 1824 and his brother Charles succeeded him. The oppressive policies of the former reign were still more prominent under the new ruler, and finally, in 1830, the ministry published ordinances suppressing the liberty of the press and creating a new system of elections. The result was the insurrection of July, 1830, by which Charles X was overthrown and Louis Philippe, Duke of Orleans, was proclaimed king. The new administration proved popular with no party, and in February, 1848, another revolution drove Louis Philippe into exile. A republic was proclaimed, and in December, 1848, Louis Napoleon, nephew of the great Napoleon, was elected president for four years. Three years later he established himself as president for a further term of ten years, and in 1852 he was able to have himself declared emperor, under the title of Napoleon III. When the votes of the people were taken, his seizure of the power was confirmed by over seven million votes.

In 1870 the uneasiness of Napoleon and the French at the steady growth of Prussian power reached a climax when the Spanish crown was offered to a prince of the House of Hohenzollern. The result of this episode was the Franco-German War, which ended in the complete defeat of the French and the capture of Paris by the German armies. Immediately on the receipt of the news of the defeat at Sedan, a republic was proclaimed in Paris, and a period of civil war followed. Thiers, the first president, resigned in 1873, and Marshall MacMahon was put in his place. In 1875 a constitution was drawn up which provided for a legislative body to consist of two chambers. By 1879, at the resignation of MacMahon, the government of France had been considerably strengthened. Jules Grévy succeeded MacMahon and was reëlected in 1885, but resigned two years later. He was succeded by Sadi Carnot, during whose administration a serious attempt was made under General Boulanger to overthrow the republic. Three parties, the Orleanists, the Bonapartists and the Radicals, were interested in this movement, and as Boulanger was very popular throughout the country, it seemed as if matters might end disastrously for the government; but the popularity of the leader waned, and he was finally obliged to flee from the country. A great sensation was also created during Carnot's administration by the failure of the Panama Canal scheme, which led to the prosecution of a number of noted men. Carnot was assassinated in 1894 and was succeeded by Casimir-Périer, who resigned in less than a year. His successor was Félix Faure, who was succeeded by Emile Loubet. In 1906 Falliéres became president, followed by Poincaré in 1913, Deschanel in 1920, Millerand in 1921.

The year 1914 saw the outbreak of the great war that eventually involved nearly all the nations of the world. The heroic part taken by France in the struggle is described in detail in the article WORLD WAR.

Related Articles. Consult the following titles for additional information:

CITIES AND TOWNS

Agincourt
Amiens
Bordeaux
Brest
Calais
Cherbourg
Crécy
Dunkirk
Fontainebleau
Havre
Lille
Limoges
Lyons
Marseilles
Metz
Nancy
Nantes
Nice
Nimes
Orleans
Paris
Rheims
Roubaix
Rouen
Saint Etienne
Saint Quentin
Strassburg
Toulon
Toulouse
Tours
Verdun
Versailles

COAST WATERS; RIVERS

Aisne
Atlantic Ocean
Biscay, Bay of
English Channel
Garonne
Loire
Marne
Mediterranean Sea
Meuse
Moselle
Rhone
Saône
Seine
Somme

MOUNTAINS

Alps
Cevennes
Jura
Mont Blanc
Pyrenees
Vosges

HISTORY

Aix-la-Chapelle, Congress of
Aix-la-Chapelle, Treaties of
Albigenses
Alsace-Lorraine
Bastille
Bonaparte
Bourbon
Brittany
Burgundy
Capetian Dynasty
Carolingians
Chivalry
Commune of Paris
Continental System
Crécy
Crimean War
Croix de Guerre
Crusades
Directory
Emigrés
Feudal System
Field of Cloth of Gold
Franco-German War
French and Indian War
French Revolution
Fronde
Gascony
Gaul
Girondists
Guise
Huguenots
Hundred Years' War
Jacobins
July Revolution
Legion of Honor
Leipzig, Battles of
Liberty Cap
Louisburg, Sieges of
Merovingians
Mississippi Scheme
Nantes, Edict of
Normandy
Normans
Orleans
Panama Canal
Paris, Treaties of
Parlement
Powers, The Great
Quebec, Battle of
Reformation
Renaissance
Saint Bartholomew's Day, Massacre of
Salic Law
Sedan, Battle of
States-General
Succession Wars
Trafalgar
Triple Alliance
Triple Entente
Valois
Vienna, Congress of
Waldenses
Waterloo, Battle of
World War
X.Y.Z. Correspondence

BIOGRAPHY

Barras, Count de
Bayard, Chevalier de
Carnot, Marie Francois
Catharine de'Medici
Charlemagne
Charles VI
Charles VII
Charles IX
Charles X
Charles Martel
Charles the Bold
Clemenceau, Georges
Clovis
Danton, Georges Jacques
Delcassé, Theophile
Dreyfus, Alfred
Fallières, Clement Armand
Foch, Ferdinand
Francis I
Frontenac, Comte de
Gambetta, Leon
Genet, Edmon Charles Edouard
Godfrey de Buillon
Grevy, Jules
Guizot, Francois
Henry III
Henry IV
Joan of Arc
Joffre, Joseph Jacques
Lafayette, Marquis de
Loubet, Emile
Louis I
Louis IX
Louis XI
Louis XII
Louis XIII
Louis XIV
Louis XV
Louis XVI
Louis XVII
Louis XVIII
Louis, The German
Louis Philippe
MacMahon, Marie E.
Marat, Jean Paul
Mazarin, Jules
Mirabeau, Count de
Montcalm, de Saint-Veran, Marquis de
Murat, Joachim
Napoleon I
Necker, Jacques
Ney, Michel
Poincaré, Raymond
Pétain, Henri
Richelieu, Duke de
Robespierre, Maximilien
Rochambeau, Count de
Rodin, Auguste
Talleyrand-Perigord, Duke de
Thiers, Louis Adolphe

UNCLASSIFIED

Champs Elysees
Cluny Lace
Oriflamme
Sevres Porcelain

FRANCHISE, *fran'chize,* in a general and legal sense, a particular privilege or right, granted by a government to an individual, association or corporation; as, a *franchise* to construct and operate street railways, to erect a lighting plant, to lay gas mains, to install wires for electric light, or to provide a city with water. The name is especially given to the right to vote.

FRANCIS I (1708–1765), Holy Roman emperor. In 1736 he married Maria Theresa, daughter of the emperor Charles VI, and after the death of Charles VI (1740) he was declared by his wife co-regent of all the hereditary states of Austria, but without being permitted to take any part in the administration. He became emperor in 1745.

FRANCIS II (1768-1835), Holy Roman emperor and emperor of Austria, succeeded his father in 1792. France declared war against him in 1792, and hostilities continued till the Peace of Campo Formio in 1797. In 1799 he entered into a new coalition with England and Russia against the French republic, but the result of the Battles of Marengo and Hohenlinden was far from favorable to Austria. In 1804 Francis assumed the title of hereditary emperor of Austria, and in the following year, after the Battle of Austerlitz, he was forced to give up his title of Holy Roman emperor. In 1809 he again took up arms against France, and in the Peace of Vienna was compelled to surrender much territory. After the overthrow of Napoleon, Francis became a member of the reactionary Holy Alliance, under the guidance of his minister, Metternich.

FRANCIS'CANS, the members of the religious order established by Saint Francis of Assisi about 1210. They are also called Minorites, or Friars Minor, which was the name given them by their founder in token of humility, and sometimes Gray Friars, from the color of their garment. The Order is distinguished by vows of absolute poverty and a renunciation of the pleasures of the world. The Franciscans have been notably identified with missionary work in the United States and Canada.

FRANCIS JOSEPH I (1830–1916), emperor of Austria and king of Hungary, and next to the last of the Hapsburg rulers. He was the eldest son of Archduke Francis and a nephew of Ferdinand I, whom he succeeded as ruler of the old Austrian monarchy in 1848. Ascending the throne at the age of eighteen, he passed a life crowded with personal sorrow, fated to witness the diverse and antagonistic peoples of his realm grow more and more restive from year to year. After a rule of sixty-eight years, he died in the midst of the great war which he had helped to bring about.

FRANCIS JOSEPH I

Shortly after Francis Joseph ascended the Austrian throne the Hungarians, under the leadership of Kossuth, revolted. This revolt and another uprising in Sardinia were quickly crushed. For the next four years the emperor was almost completely dominated by his ministers, but in 1852 the personal rule of the emperor really began. Except on rare occasions Francis Joseph was thereafter the real ruler of his empire. He not only appointed ministers but controlled their policy. Owing to his great knowledge of affairs and his unending diligence and capacity for work, he had a real control even over the details of government. Early in his reign his policy was conservative—almost reactionary—but in later years he showed a broader view of affairs and a willingness to grant necessary reforms. After the disastrous war with France and Sardinia in 1859 and the Seven Weeks' War with Prussia in 1866, Francis Joseph saw the need of liberal action, and in 1867 the relations of Austria and Hungary were adjusted by the grant of a constitution to Hungary. This year marks the date of the establishment of the dual monarchy of Austria-Hungary, in which Francis Joseph ruled as emperor of Austria and king of Hungary.

In 1883 Francis Joseph became a party to the Triple Alliance, though Germany and Italy were nations built on the ruins of Hapsburg ambitions. In his foreign policy he was an advocate of European peace, though he seemed not unwilling to break it for the glory of Austria, for in 1908, contrary to the Treaty of Berlin, he proclaimed the annexation of Bosnia and Herzogovina to Austria-Hungary.

In private life the emperor was the victim of many catastrophes—his wife, his brother, his only son and his nephew having met violent deaths. His brother, Emperor Maximilian of Mexico was shot in 1867. His son, Crown Prince Rudolph, committed suicide in 1889, and his wife, the Empress Elizabeth, was killed in Geneva, Switzerland, by an Italian anarchist in 1897. The last of these catastrophes was the assassination of the Archduke Franz Ferdinand, nephew of Francis Joseph and heir to the throne. The causes of this last tragedy and its terrible results are explained in the articles WORLD WAR. When Francis Joseph died (1916) his nephew Charles succeeded him, but ruled only two years. In 1918, toward the close of the World War, Austria-Hungary broke up into various separate nations, and Charles was forced to abdicate. For other details, see AUSTRIA-HUNGARY, and titles listed at the end of that article.

FRANCIS OF ASSISI, SAINT (1182–1226), an Italian monk, founder of the religious Order of Franciscans. In his youth he decided to devote his life to the poor and afflicted, and he gave up every possession and lived by alms. As he preached the number of his followers increased, and he went to Rome and obtained the Papal permission to found a religious order. His followers were sworn to poverty, chastity and obedience. They were sent out as missionaries, and the number of friars increased rapidly. Saint Francis was a favorite subject of the early Italian painters, and his simple, austere life, particularly his love of all created things, has inspired many men in all subsequent ages.

FRANCK, *frahnk*, CÉSAR AUGUSTE JEAN GUILLAUME HUBERT (1822–1890), one of the most celebrated of later French composers. During this master's life he had only a small, though select, following; since the beginning of the present century, however, his genius has been more widely recognized. The outward facts of his life are few. He studied at the conservatories of Liège, his native town, and Paris. His principal works are a mass, two operas, a symphony, several "symphonic poems," numerous works for the organ, four oratorios and various pieces of chamber music.

FRANCO-GERMAN WAR, a short struggle (1870–1871) between France and Germany which might have been averted had it not been for the scheming of the Prussian Prince Bismarck. However, two important considerations contributed to bring on the conflict. France, an empire, was jealous and fearful of the growing power of Prussia; the emperor, Napoleon III, realized that his throne was insecure, and he believed a victorious war would strengthen his position. Bismarck was working for a united and strengthened Germany, and he believed in war as an agent to achieve that end. Austria had been humbled (see SEVEN WEEKS' WAR); Prussian influence was paramount in that country, and it controlled all Germany, and Bismarck determined it should be felt throughout the continent.

The immediate cause of the Franco-German War, however, was the offer of the crown of Spain to Leopold of Hohenzollern, a prince of the reigning house of Prussia. Napoleon III demanded of the king of Prussia that he should forbid Leopold to accept the candidacy, and when the prince voluntarily retired, Napoleon still insisted that the renunciation should be made formally by the king and that a guarantee should be given that the refusal was final. Prussia of course refused this demand. Bismarck was ordered to make public the demand of France, and he did so, but not fully, for he published only such parts as would anger the Germans. The result was a declaration of war by France.

In Prussia the certainty of war had long been foreseen, and the country was well prepared. In France, however, conditions were much less favorable, and Napoleon III was completely deceived as to the resources which were at his command. At the outset of the struggle the French had an army only about half as large as the Prussian, while back of the latter was a reserve force larger than the entire army of France. From the first France met with defeats. At Weissenburg and at Wörth the Germans were victorious; they separated the two divisions of the French army under MacMahon and Bazaine and prevented their junction. MacMahon, in September, 1870, was surrounded at Sedan and compelled to surrender both army and fortress. Among the prisoners was Napoleon III. Meanwhile, Bazaine had been shut up in Metz, and in October of the same year he, too, was forced to surrender.

One of the first consequences in France of the defeat at Sedan was the deposition of Napoleon and the proclamation of the third republic. Immediate preparations were made in Paris to withstand a siege, but the utmost efforts of the French could not relieve the city, and in February, 1871, it was forced to yield. By the terms of the treaty, which was signed in May of the same year, France was obliged to give up Alsace and a part of Lorraine and pay a war indemnity of about $1,000,000,000; and it was provided that a German army should hold certain departments of France until the entire indemnity was paid.

The Germans thought the enormous indemnity could not be paid in a generation, and that France would be at the Prussians' mercy for many years; but the new republic astonished the world by paying the full amount in three years and thus early ridding the country of the last of the German army of occupation. The humiliation of the period was never forgotten by the French.

The seizure of Alsace-Lorraine (which see) was bitterly resented by the French, and its recovery was one of the objects for which France fought in the World War (1914–1919). See FRANCE, subhead *Location and Size;* WORLD WAR.

FRANCOLIN, *frang'koh lin,* a genus of birds related to the partridges, found in Asia and Africa. There are more than forty species, most of which are considered good game birds. The commonest, the *redwing,* of South Africa, is hunted by English colonists. The birds are very rapid on their feet, and fly heavily, with a whirring noise. They feed in the evening and morning, intermittently making a loud, shrill cry that sounds somewhat like laughter.

FRANK'FORT, IND., founded in 1830, is the county seat of Clinton County, forty-five miles northwest of Indianapolis, on the Vandalia, the Lake Erie & Western, the Toledo, Saint Louis & Western and the Chicago, Indianapolis & Louisville railroads. The city is in an agricultural district, and has manufactures of kitchen cabinets, porcelain signs, cigars, flour, lumber, bricks, machinery, agricultural implements and other articles. The Toledo, Saint Louis & Western has railroad shops here. There is a Carnegie Library, a hospital and a court house. Population in 1910, 8,634; in 1920, 11,585, a gain of 34 per cent.

FRANKFORT, KY., founded in 1786, the capital of the state since 1792 and the county seat of Franklin County, is fifty-five miles east of Louisville, on the Chesapeake & Ohio, the Louisville & Nashville and the Frankfort & Cincinnati railroads, and on the Kentucky River, in the heart of the Blue-grass region. The stream is navigable, and it furnishes water power for manufactories. On a hill near the city is Franklin Cemetery, which is considered one of the most beautiful in the South; here Daniel Boone and Vice-President Johnson are buried.

The prominent buildings include the governor's mansion, one of America's handsomest state capitols, a Y. M. C. A. building, an arsenal, a penitentiary, a home for feebleminded children and a state normal school for colored students. The industries include the manufacture of shoes, chairs, twine and brooms, and there are five large tobacco warehouses. The city has long been an important distilling and whisky center; the decline of that industry has been notable. Frankfort was founded by General James Wilkinson in 1786, and it became the capital when the state was admitted to the Union. Population, 1910, 10,465; in 1920, 9,805, a decrease of 6 per cent.

FRANKFORT-ON-THE-MAIN, GERMANY, an important railroad and banking center of Prussia, situated in the province of Hesse-Nassau, twenty miles northeast of Mayence (Mainz). The city has many fine residences and public buildings. It lies chiefly on the right bank of the River Main, and by way of this stream and the Rhine has direct connection with the ocean. It is also the junction point of at least seven railways. The most remarkable of the churches is the Dom, or Cathedral, of Saint Bartholomew. Other buildings are the new opera house, one of the finest buildings of the kind; the courts of justice, of modern construction; the new exchange, a spacious and handsome edifice; the large palace of the Prince of Thurn and Taxis; one of the finest railway stations in the world; the archive building; the post-office; the house in which Luther dwelt, and that in which Goethe was born. Frankfort is rich in collections connected with literature and art and in establishments to promote them. The chief of these are the Historical Museum, the Stadel Art Institute and the Rothschild Library.

The manufactures comprise chemicals, ornamental articles of metal, sewing machines, straw hats, soap, perfumery and beer. A great business is done in money and banking, for the city is one of the chief financial centers of Europe.

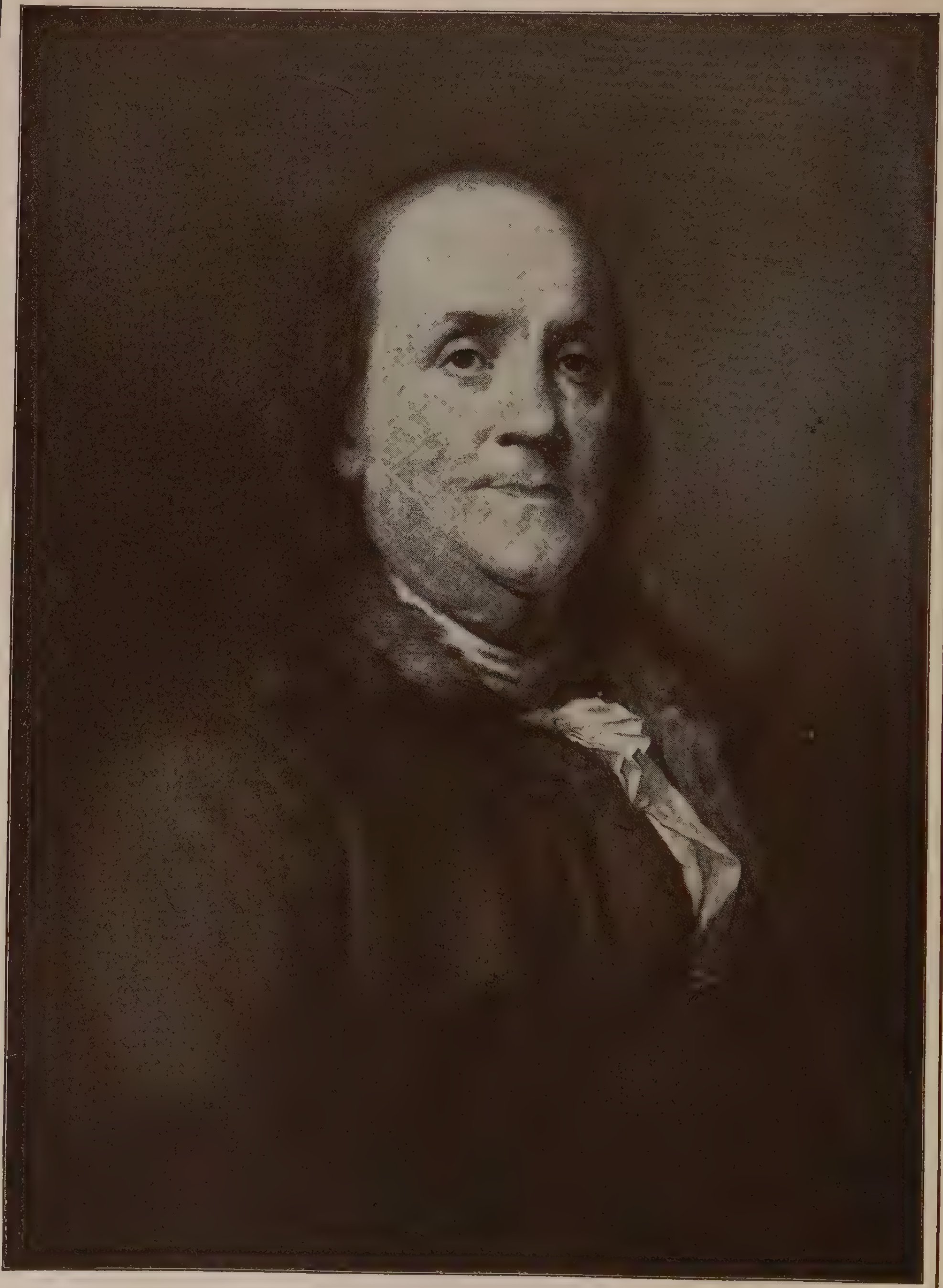
Frankfort dates from the time of Charlemagne. In the thirteenth century it became a free city and for a long time after this was the place of the election of the German emperors. It was a prosperous and powerful city up to the time of the wars of the French Revolution, when it declined. On Napoleon's downfall, Frankfort became a free city, and by the Congress of Vienna (1815) it was made the seat of the German diet. In 1866 it was incorporated with Prussia. During the World War the city was repeatedly attacked by allied airships. Population, 1918, 414,578.

FRANK'ING, the privilege of sending letters and packages through the mail without charge. The right was abolished by Parliament in Great Britain in 1840. In the United States it was first granted to Revolutionary soldiers, then to various officers of the government and to senators and representatives in Congress. It was abolished in 1873, but was later restored. It is now possible for all officers of the government to send public documents through the mail without charge. Seeds and agricultural reports are also sent free of charge. The privilege, it is charged, is abused by Congressmen, who take advantage of the system to mail their speeches to millions of constituents. The franking privilege is usually extended to the widows of former Presidents.

FRANKLAND, or **FRANKLIN,** a name given in 1784 to a state organization by inhabitants of what is now a part of Tennessee, then a part of North Carolina. It was formed as a protest against the action of North Carolina in depriving the citizens in this region of state government. At the close of the Revolutionary War Congress had no money to pay debts, and asked all the states holding Western lands to donate them to the Federal government. North Carolina agreed, but the settlers disapproved and set up a new state which they named Frankland, or Franklin. A constitution was framed and ratified, and a legislature and a governor, John Sevier, were elected. After a bitter struggle the new government was suppressed by North Carolina in 1788. In 1790 the territory of Tennessee was ceded to the United States government, and thus the disturbance was quieted. See TENNESSEE, subhead *History.*

FRANKLIN, a former district of Canada, now a part of the North West Territories, named for Sir John Franklin. It was composed of all the islands north of the mainland. The area was estimated at 500,000 square miles. See NORTH WEST TERRITORIES.

FRANKLIN, BATTLE OF, a battle of the Civil War in America, fought November 30, 1864, at Franklin, Tenn., between a Federal force of about 25,000 under General Schofield and a Confederate force of about 40,000 under



BENJAMIN FRANKLIN

One of the most useful citizens and public men his country has ever had. He almost always got what he went after, and he got much for his country in the days when it was in great need. Of him it might be said that he was "as wise as a serpent and harmless as a dove." Through his life and his writings he has influenced a host of people to be better Americans.

General Hood. It was the result of Hood's plan to draw Sherman from his advance to the sea by taking a large Confederate force into Tennessee and Kentucky and threatening the North Central states. Thomas had been detached from Sherman's army and sent north to Nashville. Schofield was also given a considerable force, with instructions to delay Hood's advance northward as long as possible. The Confederates gradually forced Schofield to retreat toward Nashville, but the Federals made a stand at Franklin, on the south side of the Harpeth River. At first, through a misunderstanding of orders, the Federals were thrown into great confusion, but after a long struggle the Confederates were compelled to withdraw from the attack, and Schofield withdrew toward Nashville.

FRANKLIN, Benjamin (1706–1790), an American indispensable to the age in which he lived—printer, publisher, author, scientist, philosopher, wit, colonial Legislator, postmaster-general, commonwealth builder, colonial agent to England, envoy to France. He was a citizen of two colonies and an official of four, and later a main supporting pillar of the United States of America.

Franklin was born of lowly parentage, in Boston, January 17, 1706. His father was an important factor in the city's lighting system—he made the tallow candles the people used. The son Benjamin turned to another means of livelihood. He was apprenticed to his brother in the printer's trade. There his genius found first expression, and he began to write secretly articles in prose and poetry for the New England *Courant,* which his brother published. They were well received, but when his brother learned of their authorship, Franklin was severely lectured for his presumption and was treated with great harshness.

Soon after, he left his brother's employment and, at the age of seventeen, started for Philadelphia, where he obtained work as a printer. There he attracted the notice of Sir William Keith, the governor of Pennsylvania, who induced him to go to England, for the purpose of purchasing types to establish himself in business. Keith's support was soon withdrawn, and after a residence of eighteen months in London, Franklin returned to Philadelphia, where in a short time he formed an establishment with a person who supplied the necessary capital. They printed a newspaper, the *Pennsylvania Gazette,* which was managed with much ability. By Franklin's exertions a public library, improved systems of education, a scheme of insurance and other philanthropies were established in Philadelphia. In 1732 he began to publish his *Poor Richard's Almanack,* which was issued till 1757, winning for him a wide reputation as philosopher and wit. This publication reached the unprecedented sale of 10,000 copies a year.

In Boston in 1746 he saw some electrical experiments, which led to investigations which resulted in the identification of lightning and electricity, by flying a wired kite in the clouds, and the invention of the lightning conductor. As member of the provincial assembly of Pennsylvania he became very active, and was sent in 1757 to England as the agent of the province and was also soon appointed agent there of the provinces of Massachusetts, Maryland and Georgia. Oxford and Edinburgh conferred on him their highest academic degrees, and the Royal Society elected him a fellow. In 1762 he returned to America, but was again appointed agent in 1764 and took to England a remonstrance against the project of taxing the colonies. He opposed the Stamp Act and in 1774 presented to the king the petition of the first American Congress, but realizing the futility of his efforts, he returned to America and was elected member of the Continental Congress. He exerted all his influence in favor of the Declaration of Independence. In 1776 he was sent to France as minister plenipotentiary, to obtain supplies from that court, and he concluded with France the first treaty of the United States with a foreign power (1778). He was subsequently named one of the commissioners for negotiating the peace with England. On his return to his native country in 1785, he filled the office of president (governor) of Pennsylvania, was a delegate in the Federal convention in 1787, approved the Constitution and did much to secure its ratification. His works include an unfinished *Autobiography* and a great number of scholarly papers.

He died April 17, 1790. Excepting George Washington, it is agreed there never was a greater early American.

FRANKLIN, JOHN, Sir (1786–1847), an English Arctic explorer. After eighteen years' service in the British navy he was appointed to command of the *Trent*, a brig fitted out to sail north of Spitzbergen and cross the Polar Sea. The expedition was unsuccessful, but Franklin succeeded in tracing the hitherto unknown coast of North America from the mouth of the Coppermine River eastward to Point Turnagain. On his return to England he was promoted to a captaincy and made a member of the Royal Society. Later he returned and surveyed 40° of coast. In 1829 he was knighted. In recognition of his services to geographical science he received the honorary degree of D. C. L. from Oxford and the gold medal of the Geographical Society of Paris. From 1836 to 1843 Sir John was Lieutenant-Governor of Van Diemen's Land, now Tasmania. In 1845 he took command of the *Erebus* and *Terror* for an expedition in search of the Northwest passage. He never returned, and numerous search parties were sent out before any trace of him was found. In 1859 a document was found which gave the latest details of the ill-fated expedition. This paper stated that Sir John died June 11, 1847; that the ships were abandoned in April, 1848, and that the crews, 105 in number, had started for the Great Fish River. None survived, but many relics of the party were recovered. See NORTH POLAR EXPLORATION.

FRANKLIN, PA., the county seat of Venango County, 123 miles north of Pittsburgh, on the Allegheny River and on the Pennsylvania, the Erie, the Lake Erie, Franklin & Clarion and the New York Central railroads. The city is in the center of great oil fields, and has flour mills, machine shops, foundries, brickyards and manufactories of tools and other articles. The place was settled about 1753. Population, 1910, 9,767; in 1920, 9,970.

FRANKS, THE, a confederation of Germanic tribes which first appeared in history in the third century A. D., and subsequently supplanted the Roman power in Gaul. In the beginning there were two groups, the Salian Franks, who lived along the lower courses of the Rhine, and the Riparian Franks, who dwelt on both banks of the Rhine along its middle course. The real greatness of the Franks began with Clovis (481–511), who subjugated the country from the Pyrenees to Friesland and from the Atlantic to the Main; he became converted to Christianity and made it the state religion.

One of the most powerful of the Frankish kings was Charles Martel, who in 732 at Tours checked the Saracenic invasion and saved all Europe to Christianity. Under Charlemagne (742–814), who became the first Christian emperor of Rome in 800, the Franks attained supreme power in Europe, and their dominions extended from the North Sea to Croatia and Slavonia. The empire fell to pieces in the hands of weak successors, and the Treaty of Verdun, in 843, marked the virtual dissolution of the Frankish monarchy.

FRANZ-JOSEPH LAND, *frahnts' yo'zef lahnt*, a group of sixty islands in the Arctic Ocean, lying north of Nova Zembla. The surface is a plateau of basaltic rock from 400 to 500 feet above the sea. The highest points rise to about 2,800 feet. This land is largely covered with glaciers, but in some places lichens, mosses, saxifrage and other Arctic plants grow. It was discovered by the Austro-Hungarian expedition under Weyprecht and Payer, in 1873.

FRA'SER RIVER, the principal river in British Columbia. It has its origin in the union of two branches. The one to the west receives its waters from a series of lakes, and, flowing in a southeasterly direction for 260 miles, it unites near Fort George with another branch from the east which rises in the Rocky Mountains. From this point it flows south and after a total course of about 750 miles it ends in the Gulf of Georgia. Its chief tributaries are the Stuart, the Chilcoten and the Thompson. Gold is found both in the Fraser and its affluents, and the salmon fisheries are important. New Westminster, Hope, Yale and Lytton are on its banks. Between Lytton and Yale the Fraser flows through some of the most beautiful scenery in the country.

FRATERNAL SOCIETIES, or **FRIENDLY SOCIETIES**, societies formed for the mutual advantage of the members and based upon the principle that by the contribution of the savings of many persons to a common fund, all can be assured of financial aid in case of sickness and death. In England these societies are called *friendly societies.* They were first organized as sick clubs, composed of friends who met occasionally for recreation and social pleasure, and who paid small sums to a common fund, for the benefit of sick members, or to pay the funeral expenses of deceased members. These societies have now become to a large extent fraternal insurance orders, and in addition to sickness and funeral benefits, they pay many other allowances, including accident and life insurance, old age pensions, widows' and orphans' annuities, and they maintain homes and asylums for aged or invalid members. The Ancient Order of Foresters is the largest organization of the kind in England, while the Independent Order of Odd Fellows, organized in England, but now centered in the United States, is the largest order in the world. Fraternal societies in the United States have a total membership of over nine million. The principal orders and their membership in 1918 are given below:

Freemasons	1,760,277
Odd Fellows	1,622,100
Modern Woodmen of America	921,899
Eastern Star, Order of	800,000
Woodmen of the World	732,385
Knights of Pythias	729,053
Rechabites, Independent Order of	701,040
Good Templars, International Order	620,000
Loyal Order of Moose	620,000
Improved Order of Red Men	479,033
Benevolent and Protective Order of Elks	442,658
Order of Eagles	400,000
Royal Arch Masons	422,359
Ancient Order of United Workmen	350,000
Knights of Columbus	346,560
Order of Owls	346,754
The Maccabees	331,756
Royal Neighbors of America	318,772
Ancient Order of Hibernians	250,000
Royal Arcanum	244,722
Knights Templar	237,368
Foresters of America	205,756
Independent Order of Foresters	218,074

FRATERNITIES, College, or "Greek letter" societies, as they are often called, are organizations of students in colleges and universities. They receive their names from two or more letters of the Greek alphabet, as *Delta Kappa Epsilon.* Each of these letters is the beginning of a word of the secret motto of the fraternity. Most of the large fraternities have branches, or "chapters," in nearly every large college. There can be only one chapter of the same society in a college. Each fraternity has a general government and holds conventions either annually or biennially. There are several professional fraternities, composed of students in schools of medicine, law and dentistry.

The first fraternity formed was Phi Beta Kappa, founded at William and Mary College, Va., in 1776. This is now an honorary organization, membership in which implies a certain scholarship standard. There are at present over a hundred college fraternities in the United States. The following are the oldest, with dates and places of founding:

Alpha Delta Phi (1832, at Hamilton College, N. Y.), *Psi Upsilon* (1833, at Union College, N. Y.), *Kappa Alpha* (1835, at Union College, N. Y.), *Beta Theta Pi* (1839, at Miami College, Ohio), *Chi Psi* (1841, at Union College, Schenectady, N. Y.), *Delta Kappa Epsilon* (1844, at Yale).

The first women's fraternities, or sororities, to be organized were the *Kappa Alpha Theta,* at De Pauw University, in 1870; *Kappa Kappa Gamma,* at Monmouth College, 1870; *Delta Gamma,* at the University of Mississippi, 1872; *Alpha Phi,* at Syracuse, 1872; *Gamma Phi Beta,* at Syracuse, 1874.

FRAUD, an act or course of deception, deliberately practiced with the view of gaining an unlawful or unfair advantage and resulting in legal injury to another. All frauds or attempts to defraud, which cannot be guarded against by common prudence, are indictable at common law and are punishable according to the heinousness of the offense. Every species of fraud which the law recognizes renders voidable every transaction into which it enters. Fraud may be by false representation of fact, by concealment of material circumstances that ought to be revealed, by underhanded dealing or by taking advantage of imbecility or of an intoxicated person.

FRAUNHOFER, *frown'ho fur,* Joseph von (1787–1826), a distinguished German physicist and optician. From a humble beginning he rose to the ownership of a successful optical business. Throughout his life he was a diligent student and investigator—that rare combination, a successful business man and a scholarly scientist. His technical skill and mathematical knowledge combined to produce exceptionally fine instruments. His inventions were numerous, including a machine for polishing parabolic surfaces, a micrometer, a heliometer and an achromatic microscope. He made the essential parts of the refracting telescope. But that which has made Fraunhofer famous was his discovery of the dark lines in the solar spectrum which have been named for him.

FRECHETTE, *fra shet′,* LOUIS HONORE (1839–1908), the greatest of French-Canadian poets, born at Levis, Quebec. He was educated at Quebec Seminary and Laval University, and was called to the bar in 1864. As editor of the *Journal de Levis,* which he founded, he came into public notice for his revolutionary doctrines, and was compelled to leave Canada. After several years spent in newspaper work in Chicago, he returned to Canada in 1871. He practiced law in Quebec until 1874, when he was elected to represent Levis in the House of Commons. After being defeated for reëlection in 1878 and again in 1882, he retired from politics and devoted himself to literature. In 1884 and 1885 he edited *La Patrie* (Montreal). His principal works, all in French, are *Mes Loisirs, La Voix d'un Exile, Pêle Méle, Les Oiseaux de Neige,* crowned by the French Academy, and two historical dramas, *Papineau* and *Felix Poutré.*

LOUIS FRECHETTE

FRECKLES, *frek′l′z,* small brownish spots which sometimes appear on the face and hands after exposure to wind and sun. Those persons who freckle have the pigment, or coloring matter, of the epidermis unevenly distributed, and instead of tanning uniformly under exposure they tan in spots. Usually fair-skinned persons are more subject to freckles than dark ones, and the red-haired are almost sure to have them. Occasionally one sees a mulatto with these spots. While children are more prone to freckle than are adults, there are people who never outgrow the tendency. There are numerous cosmetics advertised to remove freckles, most of which contain a bleach, such as hydrogen peroxide. Even if removed, the spots will return on exposure, and the only way to prevent this is to protect the face or hands.

FREDERICK, MD., the county seat of Frederick County, sixty miles northwest of Baltimore, on the Baltimore & Ohio and the Pennsylvania railroads and an interurban line. The city has large canning establishments, planing mills, brick yards, flour mills and manufactories of tobacco, hosiery and brushes. Hood College, for women, Hood Seminary and a convent school are here.

Its chief interest lies in its connection with important historical events and characters. During the Civil War the place was twice occupied by Confederate troops, and the second time the citizens were forced to pay a very heavy ransom. Whittier has caused Frederick to be ever remembered as the scene of his famous poem, *Barbara Frietchie.* The place was settled about 1745 and was incorporated in 1817. Population, 1910, 10,411; in 1920, 11,066.

FREDERICK I (1657–1713), king of Prussia, son of the great elector Frederick William. He succeeded his father as elector of Brandenburg in 1688 and some years later assumed the title of king of Prussia. His reign was unimportant.

FREDERICK II (1712–1786), king of Prussia, known as FREDERICK THE GREAT, the "Unser Fritz" of the Germans of later periods, and the man who was idolized as the founder of Germany's military power. He was the son of Frederick William I and the princess Sophia of Hanover, sister of George II of England. He was in his youth cruelly treated by his father, and at one time narrowly escaped the death penalty for an attempt to flee to England. In 1733 he was obliged to marry the princess Elizabeth Christina, daughter of the Duke of Brunswick-Bevern. The death of his father raised him to the throne in 1740, and it was not long before he asserted the claims of the House of Brandenburg to a part of Silesia, then held by Maria Theresa. As his proposals were rejected, he occupied Lower Silesia, defeated the Austrians near Mollwitz and at Chotusitz, and the First Silesian War was terminated by the peace signed at Berlin in 1742, leaving Frederick in possession of Silesia. Soon the Second Silesian War broke out, the result of which was equally favorable for Frederick. By the Peace of Dresden he retained Silesia and acknowledged the husband of Maria Theresa, Francis I, as emperor.

FREDERICK THE GREAT

During the years of peace which followed. Frederick devoted himself to domestic administration and to the improvement of the Prussian military system. He perfected the organization of his army, and learning that Maria Theresa, who had made strong alliance, meant to make a renewed attempt to gain Silesia, he anticipated his enemies by the invasion of Saxony (1756), with which the Seven Years' War began. The Peace of Hubertsburg (1763) terminated this war, and Frederick kept the territory over which there had been so much contention. He came out of this war with a reputation which promised him, in the future, a decisive influence in the affairs of Germany and Europe.

His next care was the relief of his kingdom, drained and exhausted by the contest. This he prosecuted with great diligence and liberality, making many improvements in institutions and in agriculture. On the partition of Poland in 1772 Frederick received a large accession to his dominions. In 1779 he frustrated the designs of Emperor Joseph II on Bavaria, and the War of the Bavarian Succession was terminated without a battle by the Peace of Teschen. Late in life Frederick concluded, in connection with Saxony and Hanover, the confederation of the German princes.

FREDERICK III (1831–1888), king of Prussia and emperor of Germany. In 1858 he married the princess royal of Britain, eldest daughter of Queen Victoria. He commanded the army of the Oder in the war with Austria (1866), and in the Franco-German War he led the army which ultimately forced Napoleon III and his army to surrender at Sedan. Early in 1888 he came to the throne, but he died three months later and was deeply mourned.

FREDERICK I, Barbarossa (1122–1190), Holy Roman emperor, received the imperial crown in 1152 on the death of his uncle, the emperor Conrad III. His principal efforts were directed to the extension and confirmation of his power in Italy. He set out on a crusade to the Holy Land in 1189 and gained two victories, but was drowned while crossing a stream in Cilicia. Frederick was one of the wisest and best of the emperors, and the belief was long current in Germany that he would some day return to rule his people.

FREDERICK II (1194–1250), son of the emperor Henry VI and of Constance, heiress of Sicily. He remained under the guardianship of Pope Innocent III till 1209, when he took upon himself the government of Lower Italy and Sicily. Three years later he was crowned emperor, promising to undertake a crusade in return for the Pope's aid against his rival, Otho IV. It was not, however, until 1227 that he actually set out on that expedition. Frederick's ambition aimed at the subjugation of Lombardy, the sovereignty of all Italy and the reduction of the Popes to their old spiritual office as the leading bishops in Christendom. This led him into constant struggles in Germany and Italy. He was one of the ablest and most accomplished of the long line of German emperors.

FREDERICK VIII (1843–1912), king of Denmark, succeeded his father, Christian IX, in 1906. Frederick was married in 1869 to Louisa, daughter of Charles XV of Sweden and Norway, and eight children were born to them. At Frederick's death his son succeeded as Christian X.

FREDERICKSBURG, Battle of, one of the most important battles of the Civil War, fought December 13, 1862, between a force of 125,000 Federals under General Burnside, supported by Sumner, Hooker and Franklin, and a force of 80,000 Confederates under Lee, supported by Jackson and Longstreet. After Lee's retreat from his first invasion of the North, the two armies had returned to their former positions near Fredericksburg, Lee occupying a practically impregnable position on bluffs overlooking the town. Burnside was at Falmouth, on the opposite bank of the Rappahannock. On December 12, however, he crossed the river in three divisions and advanced against Lee on Marye's Heights. After six assaults which resulted in not the slightest gain, but in terrible slaughter, he was compelled to withdraw. His loss was 12,500, while that of the Confederates was about 5,400. This battle resulted in the removal of Burnside from the command of the Army of the Potomac. See Civil War in America.

FREDERICK WILLIAM (1620–1688), elector of Brandenburg, generally called the Great Elector. When at the age of twenty he succeeded his father, he found the country devastated by the Thirty Years' War. He began at once to regulate the finances, to repeople the deserted towns and to build up the army. He must be considered as the founder of Prussian greatness and as the creator of a military spirit among his subjects. His part in the wars against Louis XIV, and especially his victory over the Swedes at Fehrbellin, gave to his country a prominence which it had never before attained. He left to his son a country enlarged and improved and a well-supplied treasury.

FREDERICK WILLIAM I (1688–1740), king of Prussia, son of Frederick I and father of Frederick the Great. On his accession to the thorne in 1713, he endeavored to increase the army and reform the finances, and he became the founder of the exact discipline and regularity which have since characterized the Prussian army. He had a childish love for tall soldiers, and he brought tall men from all countries and compelled them to serve in his army. A large part of Swedish Pomerania was annexed to Prussia during his reign.

FREDERICK WILLIAM III (1770–1840), king of Prussia, son of Frederick William II, whom he succeeded in 1797. During the early part of the Napoleonic struggle he remained neutral, but popular feeling finally compelled him to join the coalition against France, and Prussia suffered much through defeats at Jena, Auerstädt, Eylau and Friedland. After peace was secured, Frederick William showed himself largely in favor of the reactionary principles of Metternich and the Holly Alliance.

FREDERICK WILLIAM IV (1795–1861), king of Prussia, son of Frederick William III. When he came to the throne on the death of his father, in 1840, he gave some slight promise of a liberal government, but soon afterwards showed his reactionary tendencies, and in 1848 the people rebelled and demanded a constitution. Frederick was able to force upon the country a constitution of his own making, which allowed small concessions. Latterly his mind gave way, and he remained until his death an imbecile.

FREDERICTON, a city of New Brunswick, the capital of the province, on the Saint John River, eighty-four miles from its mouth, and on the Canadian Pacific, the Canada Government and the Fredericton & Grand Lake Coal & Railway Company railroads. The river is navigable to this point for large sea-going vessels. The city is well built and has a number of handsome public buildings, including a new post office erected in 1915. The provincial parliament and departmental buildings are here. Lumbering and trading are the chief industries, but there are also manufactures of machinery, leather and boots and shoes. The original village, known as Saint Anne, was founded in 1740; the present town was named in 1768. Population, 1921, 8,018.

FREE CITIES, the designation of German cities which gained complete independence in the twelfth century. They assisted the emperor in suppressing the nobles, and in return received certain privileges and immunities and the right to exercise sovereign jurisdiction within their own boundaries. At the time of the French Revolution the imperial cities numbered fifty-one. Later there were only three—Hamburg, Bremen and Lübeck.

FREEDMEN'S BUREAU, a bureau organized in the War Department of the United States by an act of Congress passed March 3, 1865. Its purpose was to take general charge of the enfranchised negroes of the South, and it was authorized to allot to the freedmen certain confiscated or abandoned lands. A bill continuing it for two years was vetoed by President Johnson in 1866, but was passed over the veto. The bureau continued its work until 1870 and expended over $15,000,000. It was one cause of perpetuating the enmity of the South toward Congress, for it led to the congregation of idle and vicious negroes in the vicinity of the bureau depots and caused great hardship to the planters, who could not secure sufficient labor to harvest their cotton.

FREEMAN, MARY E. WILKINS (1862–), an author of numerous short stories and novels portraying middle-class life in New England, was born in Randolph, Mass. Mrs. Freeman has an intimate knowledge of her subject, and she pictures the plain and simple folk and their dull, colorless lives with an insight and a sympathy that have given her work a permanent place in American literature. Of her novels *Pembroke* is perhaps the best. Others which have received the most favorable comment of critics are *A Humble Romance; Jerome, a Poor Man; The Portion of Labor; The Wind in the Rose Bush; Shoulders of Atlas; The Winning Lady; The Green Door; Butterfly House; Copy-Cat and Other Stories* and several other volumes of short stories. Since her marriage in 1901 to Dr. Charles M. Freeman she has lived in Metuchen, N. J.

FREEMASONRY. See MASONRY.

FREE METH′ODISTS, members of a religious sect which separated from the Methodist Episcopal Church. It was formed at Pekin, N. Y., in 1860, by the followers of two Methodist ministers who were expelled from the conference. Though agreeing in the main with Methodist doctrines, the Free Methodists have abolished the office of bishop and substituted that of an elective superintendent, with a term extending over four years; they exclude instrumental music in their services, have only extemporaneous preaching, insist on plainness of dress and living and admit all freely to their services, having no paid reserved pews. Their membership in the United States is over 35,000, and their churches number over 1,160. They maintain seminaries at North Chili, N. Y., and at Spring Arbor, Mich.

FREE′PORT, ILL., the county seat of Stephenson County, 113 miles west of Chicago, on the Pecatonica River and on the Chicago & North Western, the Chicago, Milwaukee & Saint Paul and the Illinois Central railroads. The city contains railroad shops and manufactories of automobiles, hardware, medicines and stock food, windmills, organs and wagons. It has a public library, a hospital, an orphanage and fine public buildings. Freeport was settled in 1835 and was chartered in 1885. Here in 1858 occurred a noted debate between Lincoln and Douglas, in which Douglas set forth the doctrine later known as the *Freeport heresy.* Population, 1910, 17,567; in 1920, 19,669, a gain of 12 per cent.

FREE-SOIL PARTY, an anti-slavery party which came into existence in 1848. It was formed at a convention held in Buffalo, by representatives of the old Liberty party, but was chiefly supported by the Barnburners, or Van Buren faction of New York Democrats. The convention nominated Van Buren for President and Charles Francis Adams for Vice-President, and declared that Congress should keep slavery out of the territories. The party polled nearly 300,000 votes in that year, principally in the states of New York, Massachusetts and Ohio, and secured fourteen Congressmen. In 1852, having been deserted by Van Buren's followers, the party's candidates, received only 155,000 votes. The party was absorbed into the Republican party at its organization in 1854. See POLITICAL PARTIES.

FREE′THINKER, one who refuses to accept ecclesiastical tradition in forming his religious opinions. Although the term has been applied to agnostics, skeptics and infidels, it was first applied to the English deists of the seventeenth and eighteenth centuries who argued for a rational as against a revealed religion. Chief among these were John Toland and Anthony Collins; the latter in the eighteenth century published *Discourse on Freethinking.* Leaders among advanced English freethinkers were Lord Bolingbroke and Hume. In France, Voltaire and the encyclopedists, D'Alembert, Diderot and Helvetius, led the opposition against revealed religion. Germany in the reign of Frederick the Great was a fertile field for freethinkers. The term is now generally applied to those found among Christians, as well as non-Christians, who refuse to accept revelation and who base their religious beliefs upon reasoned doctrines.

FREETOWN, or **SAINT GEORGE,** WEST AFRICA, the capital of the British colony of Sierra Leone, one of the important seaports of the western coast of Africa. The exports of the city consists largely of rubber, palm oil, gum, nuts and ginger. The town is a British coaling station and the headquarters of the British force in West Africa. It is connected with Pendembu, near the Liberian frontier, by a narrow-guage railway. Population, 1911, 37,724, of whom about 500 were Europeans.

FREE TRADE, an economic principle which broadly relates to freedom of trade between nations. Under absolute free trade a country is relieved of all tariff restrictions which would either increase or retard the natural direction of commerce. In practice, however, no country of the first class has ever adopted such a measure. For many years Great Britain has maintained a policy nearer to absolute free trade than has any other nation. Its laws relating to tariffs have not discriminated between goods of foreign and domestic manufacture, and this is indeed a free trade principle; but that country has at times imposed tariffs for the sake of needed revenue upon such staples as coffee, tea, and many other articles.

As an economic principle free trade is the direct opposite of the principle of *protection,* which maintains that a state can reach a high degree of material prosperity only by protecting its domestic industries from the competition of all similar foreign industries. To effect this, protecting countries either prohibit the importation of foreign goods by direct legislation or impose such duties as shall check the introduction of foreign goods. The principle of free trade was first advanced by Adam Smith (which see) in *Wealth of Nations.*

In the United States there never has been absolute free trade. The present-day Democratic party, in platforms as far back as 1830, has declared itself the so-called free-trade party of the republic, but no tariff law ever passed by it has approached freedom of trade unhampered by tariff restrictions. Its tariff law of 1913 lowered many duties that a preceding Republican law had imposed, and it placed several commodities, such as wool and sugar, on the free list; but on the whole an average tariff of over thirty per cent was maintained on all imports.

The theory that high tariffs foster trusts and undesirable combinations in restraint of trade is discussed in the article Protection. See, also, Tariff.

FREE WILL, the power which human beings possess of deciding for themselves. The extent to which an individual possesses this power has been the source of long controversies among both theologians and psychologists. Among theologians the principal theories are four in number, namely: First, that an act of the will is the result of circumstances and conditions beyond the person's control; second, that human affairs are governed by natural law, which acts always in the same way, hence the will always acts in accordance with that law; third, that every person's conduct is the logical and inevitable result of his previous experience and activity, and that the individual will choose in each emergency the line of conduct which his whole past experience has prepared for him; fourth, that the human will possesses of itself a special and innate power to choose between alternatives. This power it often reserves and does not always use, but when called upon, it is always present, and the individual is personally and individually responsible for every act which he does of conscious choice.

FREEZ'ING, changing from a liquid to a solid state by reason of lowered temperature. Each liquid has its *freezing point*, or degree of cold at which it solidifies, and at which it melts after having been frozen. The melting point is sometimes called the *point of fusion.* The freezing point of water, or the melting point of ice, 32° F., is taken for one of the fixed points in the thermometer (see THERMOMETER). The freezing point of mercury is 39° below zero, of sulphuric ether 46° below zero, of alcohol 203° below zero, Fahrenheit.

FREMONT, JOHN CHARLES (1813–1890), an American soldier and explorer, born in Savannah, Georgia, and educated at Charleston College. He entered the government service as topographical engineer and, in pursuit of a plan to make a geographical survey of all the territories of the United States, explored the Rocky Mountains, where he came into conflict with the Mexican authorities. He led a revolt against Mexican authority, and became military commander and civil governor of California. In 1846 a United States force under General Kearney arrived in California, but Fremont refused to recognize Kearney's authority. For this he was court-martialed. President Polk remitted the penalty, and Fremont resigned.

JOHN C. FREMONT

Fremont was the first United States Senator from the state of California and in 1856 he was nominated as the first candidate of the Republicans for the Presidency, but received only 114 electoral votes to Buchanan's 174. At the outbreak of the Civil War, he was appointed major-general, with command of the Western Department. In this position he hindered the administration by a hasty and ill-advised order of confiscation, and he was removed from command by President Lincoln in November, 1861. In 1864 he was again an unsuccessful candidate for the Presidency, and from 1878 to 1882 he was governor of Arizona.

FREMONT, NEB., the county seat of Dodge County, on the Platte River, thirty-six miles west of Omaha, on the Union Pacific, the Chicago & North Western and the Chicago, Burlington & Quincy railroads. The industrial establishments include flour mills, iron foundries, planing mills, carriage, furniture and cigar factories, stockyards; dairying interests are large. The city has a large normal college, a Carnegie Library, an orphans' home and a fine court house. The town was first settled in 1856, and was incorporated in 1871. Population, 1910, 8,718; in 1920, 9,570.

FREMONT, Ohio, the county seat of Sandusky County, thirty miles east of Toledo, on the Sandusky River and on the Lake Shore & Michigan Southern, the Wheeling & Lake Erie and the Lake Erie & Western railroads. There is also interurban service. Being at the head of steamship navigation on the river and in the center of a rich agricultural region and of oil and gas fields, it is a city of considerable commercial and industrial importance. Its chief manufactures are agricultural implements, boilers and engines, electro-carbons, cutlery, stoves and ranges, paper, beet sugar and lumber products. A trading post was established here as early as 1785, and Fort Stephenson was erected in 1812. It was a popular rendezvous of Indian tribes. Population, 1910, 9,939; in 1920, 12,468 (Federal census).

FREM'STAD, Olive (1870–), a dramatic soprano, one of the greatest Wagner singers of her generation. She was born in Stockholm, Sweden, but emigrated to America at the age of twelve and lived for several years in Saint Peter and Minneapolis, Minn. She made her début as a concert singer in Boston, but later went to Berlin for study, and in 1895 made her operatic début at Cologne. After several years spent as a star in Europe she became in 1903 a member of the Metropolitan Opera Company of New York City. She has sung in the leading cities of the United States and Canada in repertory including many difficult rôles. Her greatest triumphs have been achieved as an interpreter of Wagner's heroines. In 1916 Miss Fremstad was married to Harry Lewis Brainerd of New York City, where she makes her home.

FRENCH, Alice (1850–), a novelist and story-writer, better known as Octave Thanet. She was born in Andover, Mass., but has lived much in the west and south, where she has depicted the life about her. Among her collections of stories are *Otto the Knight*, *Knitters in the Sun* and *Stories That End Well*. *We All* is a charming story for children. Among her later works are *The Man of the Hour*, *The Lion's Share* and *A Step on the Stair*. *The Bishop's Vagabond* and *Expiation* have been accorded high praise.

FRENCH, Daniel Chester (1850-1912), an American sculptor, whose splendid achievements gained for him an exalted place in the art world. He was born in Exeter, N. H., and at an early age went with his family to live in Concord, where Louisa M. Alcott, recognizing his talent, gave him helpful criticism and encouragement. At the age of twenty-three he completed the first of his important works, *The Minute Man*, for the centenary of the *Battle of Concord*.

His genius gained early recognition, and he received numerous commissions. He executed more than a dozen portraits, including those of *John Harvard*, *Lewis Cass*, *Emerson*, *Alcott* and *John Boyle O'Reilly*; several memorial reliefs, including his *Death and the Sculptor*, by many considered his greatest achievement; decorative sculpture, including the animal groups and the great gilded statue of the *Republic* at the World's Fair, Chicago, in 1893, the last one of the most striking collossal statues of recent times. Among other memorable works of this artist are the *Gallaudet Monument* and the statue of *General Washington*, the latter presented by an association of American women to the French nation.

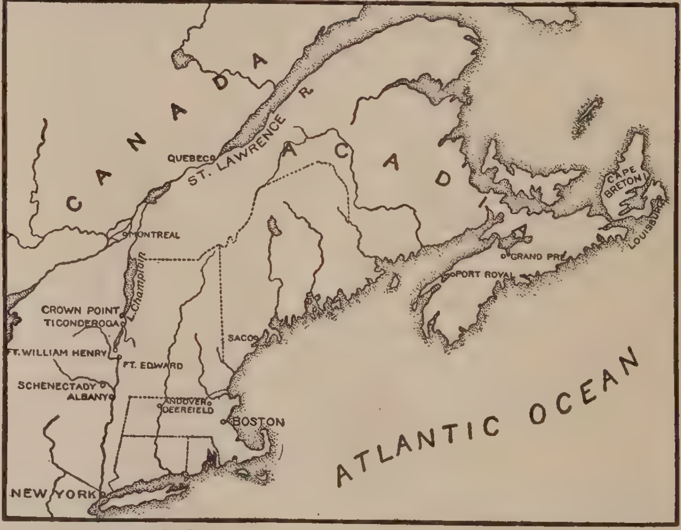
French was one of the most productive of artists; his work was inspired by the highest ideals and executed with a fine feeling for poetry and grace. He received numerous honors—was elected a member of the National Academy of Design, of the American Academy of Arts and Letters, of the Academy of San Luca, Rome, and honorary president of the National Sculpture Society.

FRENCH, John, Sir (1852–), an English military leader, prominent during the World War. He was born in Ripple, County of Kent, and was a naval cadet and midshipman before he entered the army. In his early military career he fought in the Sudan and Natal, and during the Boer War had command of cavalry. In 1907 he was raised to the rank of general, served as inspector-general of the forces until 1911, and chief of the imperial general staff from 1911 to 1914. In 1902 he was knighted, and in 1913 was made field marshal. General French was given command of the first British army corps under General Haig in Belgium at the outbreak of the World War. In

1917 he was made Lord-Lieutenant of Ireland. To this position he was reappointed in January, 1919, after the general Parliamentary election.

FRENCH AND INDIAN WARS, a name given to the series of four wars between the French and the English in America in the seventeenth and eighteenth centuries. They were the result partly of quarrels among the nations of Europe, and partly of the divergent claims of England and France in America; England claimed that settlements upon the coast gave title to land stretching from sea to sea; France, that settlement at the source of a river gave title to all lands drained by the river. As the colonies of both countries expanded westward, migration began, and the representatives of the rivals soon came into conflict.

King William's War. The first war, known in America as King William's War, was simultaneous with the War of the Palatinate in Europe, begun in 1689, and its opening was signalized by expeditions against the frontier towns of New York and New England sent out by Governor Frontenac of Canada. Hundreds of settlers were captured and killed. In retaliation the English colonists sent out two expeditions, one by land and one by sea, for the conquest of Canada. Both failed, and at the Peace of Ryswick in 1697 mutual restitution of all conquered territory in America was made. Thus the sufferings and hardships of the American campaign, undertaken because greedy kings in Europe were quarrelling, made absolutely no change in American history.



FRENCH AND INDIAN WARS IN THE NORTH AND EAST

Queen Anne's War, the second of the series of conflicts was the outgrowth of the War of the Spanish Succession waged in Europe. It began in the southern colonies with an expedition from South Carolina against Spanish towns in Florida and a counter-attack upon Charleston. The alliance between the Algonquin Indians and the French in the north proved disastrous to frontier settlements in New England, especially Deerfield and Haverhill, Mass. The English dispatched three expeditions against Acadia, the last one, in 1710, being successful. By the Peace of Utrecht in 1713 the Hudson Bay territory, Acadia and Newfoundland were ceded to England. This was another war in which only the interests of kings were in jeopardy.

King George's War. This consisted of the American operations in the War of the Austrian Succession. The first movement was a French expedition against British ports in New England and Newfoundland. The most important event of the contest was the brilliant campaign against Louisburg, Cape Breton Island, conducted by colonial forces under William Pepperell of Maine. The stronghold surrendered June 17, 1745. By the Treaty of Aix-la-Chapelle (1748), Louisburg was restored to France, contrary to the wishes of the New Englanders, and all other conquered territory was restored to its status before the war. This, the third of the intercolonial wars, inevitably led to another, for the Indians had made alliances and strong enmities, and the English were victims.

The French and Indian War. The last of the four wars, often known as the French and Indian War, was an American phase of the Seven Years' War between England and France. The three preceding struggles had accomplished nothing toward a final settlement of the territorial controversy, and frontier settlements of the two nations in the north and west constantly approached each other. The opening gun of the war was fired in 1755, when a force of Virginian volunteers under George Washington was compelled to surrender Fort Necessity, which they had built for the defense of the western region. In the same year an English force under General Braddock retaliated for this defeat by an attack upon Fort Duquesne, at the junction of the Monongahela and Allegheny rivers, on the site of the English Fort Pitt. The force was attacked in ambush and completely routed, with great loss. Other expeditions against Canada, by way of Lake Champlain and Fort Niagara, were also unsuccessful. Not until 1758 did the tide of fortune turn in favor of England. In that year Louisburg and Fort Duquesne were captured and in the following summer Ticonderoga, Crown Point and Niagara. The crowning and closing event of the war was the successful invasion of Canada by an English force under General Wolfe (see WOLFE, JAMES; MONTCALM, LOUIS JOSEPH; QUEBEC). By the terms of the Treaty of Paris in 1763, Canada and all lands east of the Mississippi were ceded by France to England. Louisiana and all lands west of the Mississippi and the Isle of Orleans were ceded by France to Spain, and Florida was ceded to England by Spain. Thus, France was driven from the North American continent and Spain remained the only rival of England in the New World.

FRENCH EQUATORIAL AFRICA, known until 1910 as FRENCH CONGO and prior to that time as the CONGO FREE STATE (see CONGO), covers an area of 982,049 square miles, and has a population of 9,000,000, mostly native races. The natives within recent years have been dying rapidly, owing to the prevalence of the sleeping sickness (which see), a scourge which science has not yet mastered.

The better though smaller part of the province lies along the Atlantic coast, under the equator, with Kamerun on the north. At the southeastern point of Kamerun another part extends northward, and this section is by far the larger. It has no definite northern boundary, but merges into French West Africa and the Sahara Desert. Anglo-Egyptian Sudan is on the east of this section; the Belgian Congo bounds the southern section in the east.

The principal products of this territory are ivory, rubber, coffee, cocoa and palm oil. Loanga has the best harbor, but there is considerable commerce from Libreville and Port Gentil; the capital is Brazzaville, on the Congo River, which forms a part of the eastern boundary.

The coast was first seen in 1740 by the Portuguese. In 1840 the French established a post, and in 1847 Libreville was founded. French interests continued to dominate the country, and in 1908 its authority was established by agreement of the powers.

FRENCH GUIANA, *ge ah'nah,* a colony of France in Northeastern South America, lying between Dutch Guiana and a northerly projection of Brazil and facing the Atlantic Ocean. It is the smallest of the three small divisions of South America which recognize European sovereignty (see BRITISH GUIANA; DUTCH GUIANA). The area of the colony is 32,000 square miles, which is about that of South Carolina. The capital city is Cayenne, whose population in 1911 was 13,527.

French Guiana has been maintained largely as a penal settlement since 1855, and to it France sends prisoners convicted of the most serious crimes. Exclusive of members of the penal colony, which numbers over 4,000, the population in 1911 was 49,009. The convicts are placed in four localities. The principal one is Ile du Diable (Devil's Island), where Alfred Dreyfus (which see) was imprisoned; it lies in the ocean thirty miles from Cayenne. The native Indians number about 2,000.

The southern point of the colony is 125 miles north of the equator, but there the elevation is 2,700 feet, and the climate is quite healthful. Near the coast the land is low, but somewhat higher than in the Dutch and British colonies to the west. The area under cultivation does not exceed 10,000 acres; corn, coffee, sugar cane, rice and tobacco are the staple products.

The colony is governed by a privy council of five members, over whom is the governor; the six are appointed in the mother country. A legislative branch of sixteen members is chosen every two years by the French residents of the colony.

FRENCH INDO-CHINA, the name applied to the French possessions in Southeastern Asia, including the colonies of Cochin-China and the protectorates of Cambodia, Annam, Laos and Tongking. It is bounded on the east and south by the South China Sea, on the southeast by the Gulf of Siam, on the west by Siam and on the north by China. The total area is estimated to be 256,200 square miles. The seat of government is Saigon. At the head of the administration is a Governor-General, under whom are the governor of Cochin-China and the superiors of the four protectorates. In 1900 France leased from China the Bay of Kwang Chow Wan, with its islands and a strip of mainland coast, for ninety-nine years. Population, about 18,000,000.

FRENCH LANGUAGE. At the time of the conquest of Gaul by Julius Caesar, the principal dialects spoken by the inhabitants were Celtic (see Celts). After the conquest these dialects were gradually supplanted by Latin (except in Brittany, where a Celtic dialect still holds its ground). In Gaul Latin underwent many modifications. Celtic words were incorporated, Celtic habits of speech were retained, and new sounds were introduced. Not only the popular speech but the language of scholars underwent a change, and by the seventh or the eighth century a distinct language had developed, with a clear line of demarcation between the literary and the common speech. With the invasion of the Franks came still further modifications. The half-barbarous conquerors, incapable of mastering the intricacy of Latin inflections, neglected them, using the simpler forms. They enlarged the vocabulary by adding a number of words, chiefly terms of war and hunting. After the Franks in Gaul had abandoned their native language and had adopted this new tongue it became known as the Romanic. The oldest known monument of the new dialect is the oath of Louis the German, taken at Strassburg in 842.

In the ninth and the tenth century two main branches or groups of dialects came to be recognized, the *langue d'oc,* spoken in the districts south of the Loire, and the *langue d'oil,* spoken in a variety of dialects in the provinces of the north and east. The words *oc* and *oil* meant "yes" in the respective districts. *Langue d'oc* may be said to have reached its height in the Provençal poetry and dialect, known especially in connection with the Troubadours. In the thirteenth century the political superiority of the north brought about the decline of the *langue d'oc,* and a dialect of the *langue d'oil,* spoken in the central province of Ile de France, where the capital, Paris, was, came to be regarded as the classical language of the country. At the beginning of the sixteenth century Francis I prohibited the use of Latin at court and in the public tribunals and formally recognized French as the national language. As one of the Romance languages, it is a sister tongue of Italian, Spanish and Portuguese. See Latin Language; Philology.

FRENCH LITERATURE. See Literature, subhead *French Literature.*

The Bastile

FRENCH REVOLUTION, The, the great revolution in France against absolutism, or autocratic government, near the end of the eighteenth century. The term in this article is understood to mean the years between the outbreak of the struggle in 1789 and the overthrow of the Directory by Napoleon in 1799. For the causes which led up to the struggle, see France, subhead *History.*

The summoning of the States-General in 1789 was virtually an abandonment of the principle of absolute monarchy in France. The first question which this body was forced to settle was that of the method of voting. The old method had been by class rather than by poll, but if this were pursued, it would mean that the nobles and clergy together could counteract the efforts of the third estate for reform. The nobles and clergy proved firm in their refusal to vote by head, and the third estate withdrew in June, 1789, and declared itself the National Assembly of France. Later, this body was joined by many of the nobles and clergy, and assumed the name Constituent Assembly. It voted to adopt a constitution before adjourning and declared the inviolability of its members.

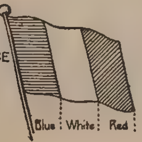
The dismissal of Necker, the popular minister, a step to which Louis XVI was led by his desire to offset the measures of the Assembly, brought about the first open insurrection of the people—the storming of the Bastille. The Assembly next declared all

THE FRENCH REVOLUTION

1789-1799

LIBERTÉ
EGALITÉ
FRATERNITÉ

MARIE ANTOINETTE



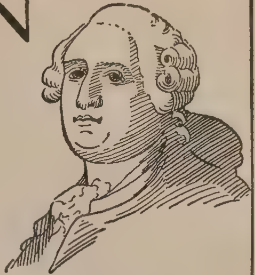
FLAG OF FRANCE

·CHRONOLOGICAL SUMMARY·

CONSTITUENT ASSEMBLY	1789
CIVIL CONSTITUTION OF THE CLERGY	1790
FIRST CONSTITUTION	1791
THE REPUBLIC	1792
EXECUTION OF LOUIS XVI	1793
THE REIGN OF TERROR	1793
FALL OF ROBESPIERRE	1794
DIRECTORY FOUNDED	1795
THE CONSULATE	1799

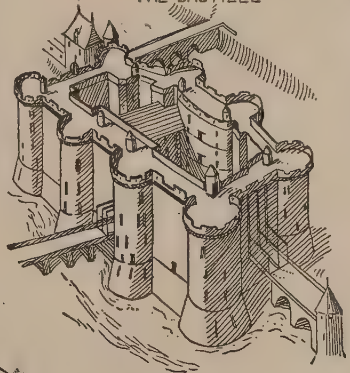
· NOTABLE CHARACTERS ·

COUNT DE MIRABEAU........
DANTON..........................
MARAT.............................
ROBESPIERRE....................
MARQUIS DE LAFAYETTE..
MADAME ROLAND............
CHARLOTTE CORDAY.......
MADAME DU BARRY.........
CAPTAIN ROUGET DE LISLE
HÉBERT...........................



LOUIS XVI

THE BASTILLE

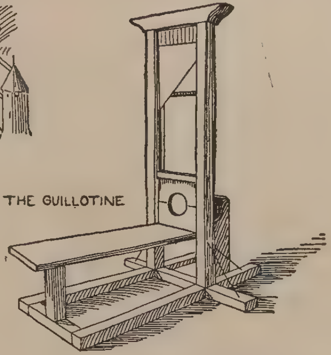


COSTUMES OF THE PERIOD

THE SPIRIT OF THE REVOLUTION

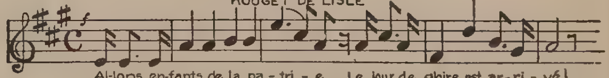
ROBESPIERRE

THE GUILLOTINE



ROUGET DE LISLE SINGING HIS HYMN, THE MARSEILLAISE

THE MARSEILLAISE
ROUGET DE LISLE



Al-lons, en-fants de la pa - tri - e, Le jour de gloire est ar-ri - vé!
(Ye sons of France awake to glory! Hark! Hark! what myriads bid you rise!)

feudal rights and privileges abolished; the National Guard was organized, and the nobles who were unwilling to accept the Revolution left France. In October of the same year a mob, composed largely of women, rushed to Versailles, put to death the royal guard and forced the king and queen to return with them to Paris. The Constituent Assembly also removed to Paris and there continued to work on the new constitution, which was ready in July, 1790. The king's oath to support the constitution was regarded by the people with suspicion, and this suspicion was increased by the constant attempts of the émigrés to gain assistance from foreign powers against the revolution (see EMIGRÉS). In June, 1791, the king and queen tried to escape from France, but were captured and brought back to Paris, where Louis was made to take oath on a revised constitution. The Constituent Assembly dissolved itself in September, 1791, and was followed by the Legislative Assembly.

In 1792, at a time when peace was especially needed in France, war was begun with Austria and Prussia, and the early defeats of the French forces were the cause of mob disturbances in Paris. A rioting band broke into the Tuilleries in August, killed the king's guard and forced Louis to throw himself on the mercy of the Legislative Assembly. The mob then forced the Assembly to imprison the king in the Temple and to declare him suspended from his royal office. In September, 1792, as a result of further reports of French defeats, serious riots broke out in Paris, and hundreds of the inmates of the prisons were murdered. The Battle of Valmy, in which the French were victorious, served to quiet for a time the disorder in Paris. The success in war was continued under the National Convention, which assembled September 20, 1792. Savoy was invaded, Belgium was conquered and Dumouriez defeated the Austrians at Jemmapes. Meanwhile, however, France had been declared a republic by the National Convention, and the announcement was now made that Belgium and Savoy were to be annexed to France. This brought forward new enemies for France, and these enemies were strengthened in their opposition to the revolutionary movement by the execution of the king.

The Convention was rent by the strife of two parties, the Jacobins and the Girondists. The latter at first had the majority, but their very unpractical character made them unfit to manage affairs at so critical a time, and the radical Jacobins before long gained control. They brought the king to trial in December, 1792, and he was condemned to death and executed January 21 of the following year. In June of that year the Jacobins were strong enough to arrest and put to death the leaders of the Girondists, and they thus held matters entirely in their own hands. The French armies were now meeting defeat at the hands of Great Britain, the Netherlands and Spain and these defeats led to still more revolutionary measures at Paris.

France was then controlled by a Committee of Public Safety, which consisted of a number of the most radical members of the Convention, under the leadership of Danton. The Reign of Terror began with the installation of that body. Among the first who fell under the suspicion of the government were Philippe Egalité, who had renounced his rank and had early identified himself with the Revolution, Marie Antoinette, and Madame Roland. All were given mock trials and sent to the guillotine. Gradually one man began to stand out supreme—Robespierre. First, with the help of Danton, he overthrew Hébert and his party and sent them to the guillotine. He then turned upon Danton and his followers, who had ventured to suggest that the Terror was passing beyond all bounds, and had them put to death. Robespierre's own turn soon came, however, and in July, 1794, he himself was beheaded (see TERROR, REIGN OF).

The more moderate members of the Convention, who had been expelled earlier, were now brought back, and in 1795, by a new constitution, the government was placed in the hands of a Directory of five persons and two legislative bodies, the Council of Ancients and the Council of Five Hundred. When an attempt was made to enforce this constitution, an insurrection in Paris was the result, and it was in suppressing this insurrection that Napoleon Bonaparte first became really prominent. Napoleon, in command of the French army in Italy, won some brilliant successes, and it seemed as if the good fortune which had attended the Convention in its latter days would continue under the Directory. Such, however, was not the case. The Austrians, while Bonaparte was absent in Egypt, invaded Italy and several times defeated the French. With the internal conditions under the Directory, also, there was great dissatisfaction. The financial difficulties could not be met; it was perceived on all sides that the government was generally weak and inefficient, and there were threats of a royalist reaction. The one desire of France now seemed to be for a strong central government, and Napoleon, still absent in Egypt, perceived that his opportunity had come. He returned to France in October, 1799, and three weeks later overthrew the Directory and put himself at the head of affairs.

For the further course of the Revolution, see Napoleon I. See, also, articles on men mentioned above, and Marat, Jean Paul; Mirabeau, Gabriel Honore Riquetti.

FRENCH SOMALI. See SOMALILAND.

FRENCHTOWN, BATTLE OF. See RAISIN RIVER, MASSACRE OF.

FRENCH WEST AFRICA, a possession of France, confirmed as such by the powers in 1899. It extends practically half across the continent at its widest part, from Senegal, on the Atlantic Ocean, eastward to about 10° east longitude. Southward it reaches the great Gulf of Guinea by the projections of the Ivory Coast and Dahomey. The total area is about 1,514,630 square miles; the population, 11,626,000, nearly all of them native blacks. The executive head of the territory is the governor-general; under him are lieutenant-governors. These officers are appointed in Paris.

FRES'CO, or **FRESCO PAINTING,** a method of mural painting in water colors on wet grounds of lime or gypsum. Mineral or earthy pigments are employed, which resist the chemical action of lime. In producing fresco paintings, a finished drawing on paper, called a cartoon, exactly the size of the intended picture, is first made, to serve as a model. The artist then has a limited portion of the wall covered over with a fine sort of plaster, and upon this, while wet, he traces the part of the design intended for the space. As it is necessary to the success and permanency of his work that the colors be applied while the plaster is yet damp, no more of the surface is plastered at one time than the artist can finish in one day. A portion of the picture once commenced needs to be completely finished before leaving it, as fresco does not admit of retouching after the plaster has become dry. On completing a day's work, the artist removes all unpainted plaster, cutting it neatly along the boundaries of forms so that the joining of the plaster for the next day's work may be concealed.

The art of fresco painting is very ancient. Specimens of it are found in India, Egypt, Mexico, Pompeii and other places. After the beginning of the fifteenth century fresco painting became the favorite method of the Italian masters, and many of the great works of such artists as Michelangelo, Raphael and Fra Angelico are frescoes on the walls of palaces and churches. Some ancient wall paintings are executed in what is called *dry fresco,* or *tempera,* which differs from the true fresco in so far that it is executed on dry plaster made moist with lime water before the colors are applied. Fresco painting has in recent years been revived. See PAINTING.

FRESNO, *frez'no,* CALIF., the county seat of Fresno County, 207 miles southeast of San Francisco, on the Southern Pacific and the Atchison, Topeka & Santa Fé railroads. The city is in the famed San Joaquin Valley, in an agricultural and stock-raising district. It exports enormous quantities of raisins, wines, brandies, grapes, oranges, olives and other fruits, also wheat, sheep and horses. Fresno has a Carnegie library, a Federal building, a city hall, a court house. Near the city is an irrigated experiment farm conducted by the University of California. The place was settled in 1872, and became the county seat two years later. Population, 1910, 24,892; in 1920, 44,616, a gain of 79 per cent.

FREY, *fri,* in Scandinavian mythology, the god of sunshine, of pleasure and of fruitfulness. The other gods, by whom Frey was much beloved, made him various presents. Among these was a magic sword, which would fight by itself the moment it was drawn from its scabbard; a ship which, while it was large enough to carry all of the gods and their attendants, could be folded up at will like a napkin; and a boar with golden bristles, on which Frey rode over land and sea with incredible swiftness. Frey fell in love with Gerda, and to obtain the assistance of his servant in gaining Gerda as his wife he was obliged to give up his wonderful sword, which was greatly missed afterwards in all combats of the gods.

FREYA, *fri'ah,* in Scandinavian mythology, the sister of Frey and the goddess of love and beauty, corresponding to the Venus of the Greeks. The conception of her differs somewhat from the classical conception of Venus, as she was regarded to some extent as a war goddess and often accompanied the valkyries when they flew down to the battlefields to carry away the slain warriors. Half of the heroes slain belonged to Freya, and she entertained them sumptuously in her palace.

FRI'AR. See MONASTICISM.

FRICTION, *frik'shun,* in physics, the resistance offered to the movement of one body by another, due to contact of surfaces. If two smooth cubes are placed one on top of the other the topmost may be lifted without resistance except that of gravity. If, however, the topmost is pushed, there is friction. If the surfaces are rough the friction is greater. In all machinery construction friction is a factor to be reckoned with. No engine can be run without it, but it can be reduced to the minimum with oil and graphite. These lubricants greatly increase the smoothness of surfaces in contact, causing them to slip against one another with the least friction possible.

FRIDAY, the sixth day of the week, the Mohammedan Sabbath, or day of assembly. In the Roman, Anglican and Greek churches Fridays are considered days of general fasts or obligation, because Christ was crucified on Friday. Because of its association with the Crucifixion, Friday is set aside as a day for the execution of convicted criminals. The old superstition about its being an unlucky day is also connected with the Crucifixion. The name is derived from the German *freitag,* which means day of *Freya.*

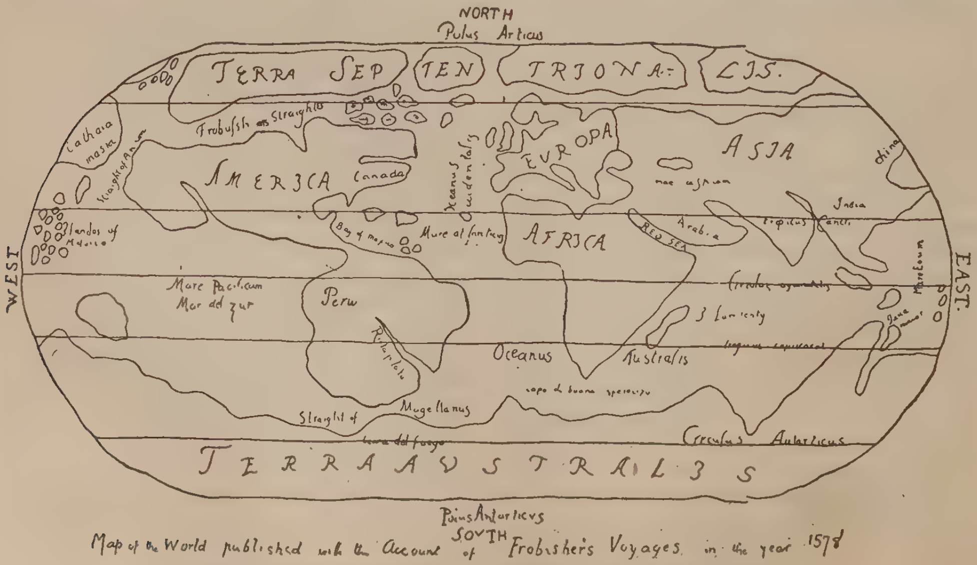
FRIENDLY ISLANDS. See TONGA ISLANDS.

FRIENDS. SOCIETY OF. See QUAKERS.

FRIG'ATE, among wooden ships of war of the older class, now wholly obsolete, a vessel of a size larger than a sloop or a brig and less than a ship of the line. It carried guns on the main deck and on a raised quarter-deck and forecastle. Such ships were often speedy, and were much employed as cruisers in the great wars of the eighteenth century and early part of the nineteenth.

FRIGATE BIRD, or **MAN-OF-WAR BIRD,** a tropical web-footed bird, related to the pelican. It takes its name from the savage attacks it makes upon gulls and other birds, when they are carrying their prey. In flight the frigate bird is powerful and grace-

FRIGATE BIRD



MAP OF THE WORLD, ACCORDING TO FROBISHER ful, and its prey is taken upon the wing. In the breeding season the pouch under the male's bill, which he is able to inflate, becomes a bright scarlet. The birds breed in large colonies on rocky cliffs or in the tops of tall trees on uninhabited islands. The upper plumage is dark brown.

FRIGGA, or **FRIGG**, in Northern mythology, the wife of the god Odin and the highest of the goddesses, corresponding in some respects to Juno in classical mythology. She is often confounded with Freya, who, however, is the counterpart of Venus. See ODIN.

FRO'BISHER, MARTIN, Sir (1535–1594), one of the greatest of Elizabethan navigators. He made three expeditions to the Arctic regions, for the purpose of discovering a northwest passage to India, and founded a settlement north of Hudson Bay. He later took part in numerous expeditions against Spain, and was killed in an attack at Brest.

FROEBEL, *frö'bel,* FRIEDRICH WILHELM AUGUST (1782–1852), a German educator, founder of the kindergarten system of instruction. He was the son of a Lutheran minister, and during his boyhood and youth obtained only a limited education. He learned forestry, but was not successful, and began teaching in a model school at Frankfort-on-the-Main in 1803. Four years later he joined Pestalozzi at Yverdun, where he remained three years studying Pestalozzi's methods. After this he studied at the universities of Göttingen and Berlin. Froebel enlisted in the volunteer movement against Napoleon, and after that he founded the celebrated school at Keilhau, where he wrought out his system of instruction during the fifteen years that he remained with the institution. Doctor Painter, in his *History of Education,* summarizes the fundamental ideas of Froebel's system as follows:

"1. The task of education is to assist natural development towards its end. As the child's development begins with its first breath, so must its education also.

"2. As the beginning gives a bias to the whole after-development, so the early beginnings of education are of most importance.

"3. The spiritual and physical development do not go on separately in childhood, but the two are closely bound up with each other.

"4. Early education must deal directly with the physical development and influence the spiritual development through the exercise of the senses.

"5. The right mode of procedure in the exercise of these organs is indicated by nature in the utterances of the child's instincts, and through these alone can a natural basis of education be found.

"6. The instincts of the child, as a being destined to become responsible, express not only physical but spiritual wants. Education is to satisfy both.

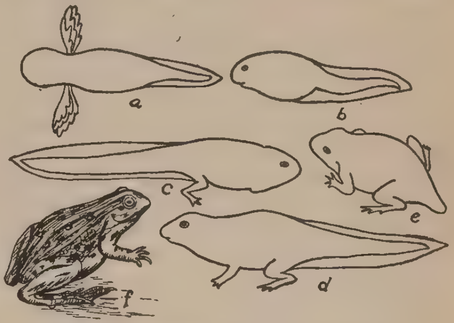
"7. The development of the limbs by means of movement is the first that takes place and therefore claims our first attention.

"8. Physical impressions at the beginning of life are the only possible medium for awakening the child's soul. These impressions should therefore be regulated as systematically as the care of the body and should not be left to chance."

In the article Kindergarten will be found a detailed account of Froebel's life and achievements.

FROG, a small, tailless animal, belonging to the same class as toads, newts and salamanders. These creatures, the amphibians (which see), start life as water animals, and in a mature state can live both on land and in water. Frogs differ from toads in having teeth and in possessing a less bulky body than their near kin (see TOAD).

Frogs are common in all parts of the world except Australia and South America. There are many species, and they inhabit widely different regions, but usually prefer swampy places and the shores of lakes and streams. The young frog, which is known as the tadpole, bears no resemblance to the parent. It has neither mouth nor limbs, but has branching gills and a long tail, with which it swims about. Its body looks like a roundish lump of dark jelly. But soon the mouth develops, the gills disappear and, as the days go on, the hind legs appear. The fore legs follow, the tail is gradually absorbed and thus the animal changes into the frog. It is an interesting transformation which any person may observe, if he will keep a few of the tadpoles where he can see them daily.



DEVELOPMENT OF A FROG
a, b, c, d, e and f show the successive stages of development.

The mature frogs breathe by lungs and cannot live in water without coming to the surface for air. They swim with great rapidity and move by long leaps, being able to jump many times their own length. In the tadpole stage, frogs live chiefly on vegetable matter, but the mature frog lives on insects, slugs, snails and the like. The flesh, especially that of the hind legs of certain species, is considered very choice food, and in France, particularly, frogs are bred for the market in large numbers.

FROHMAN, *fro'man,* CHARLES (1860–1915) and DANIEL (1853–), two brothers prominent as American theatrical managers, both born at Sandusky, Ohio. Daniel after a few years of newspaper work began his theatrical career as manager of a traveling company. Subsequently he managed several New York theaters, organized the Daniel Frohman Stock Company and became closely associated with the so-called theatrical trust, formed by his brother.

Charles Frohman was for many years prior to his death the most prominent figure in the American theatrical business. He had only a rudimentary schooling, but his educational deficiencies were in a large measure offset by an extraordinary understanding of human nature. After managing several road companies, he became manager of some of the best theaters in New York City and of the Duke of York Theater in London. In 1895 he organized a theatrical syndicate which gained control of most of the best stage talent in America. During one typical season he employed 795 actors and paid out $25,000 a week in salaries. He was instrumental in bringing forward many well-known American actors, among whom are Maude Adams, Julia Marlowe and John Drew. He lost his life in the *Lusitania* disaster, May 7, 1915.

FROISSART, *frwah sahr',* JEAN (about 1338– about 1410), French poet and historian. He received a liberal education and took orders in the Church, but his inclination was always toward poetry and tales of chivalry. From 1361 to 1366 he was secretary to Philippa, queen of England, whose favor he had won by his poetry. After the death of Philippa he became curé of Lestinnes, and during his quiet life there he worked at his *Chronicles.* After many uneventful years, he began his travels and journeyed to many parts of the world, visiting famous men and receiving their accounts of wars and expeditions in which they had engaged. Little is known of the closing years of his life. His great work is the *Chronicles,* in the four books of which he told in a vivid manner of the wars and other events of the fourteenth century.

FRONDE, *frohNd,* the name given to a struggle which took place in France between 1648 and 1653. It was directed against Mazarin and consisted of two distinct movements: the first, an attempt of the Parlement of Paris to limit the royal authority; the second, an ambitious attempt of the great nobles to gain power. In order to curb the royal authority; the Parlement refused to register certain objectionable edicts in regard to taxation, and when Mazarin arrested two members of the Parlement, an insurrection arose which forced the court to agree to demands of that body. By the following year the court party felt strong enough to withdraw the concessions made, and in the war which now broke out, Parlement had the aid of some of the great nobles of the state. The nobles were for the most part successful, but as they had no definite program laid down, they allowed their gains to slip through their fingers, and Mazarin was able to regain his old power.

The name *Fronde* is the French for *sling,* and was applied as a term of contempt, with reference to the use of the sling among the street urchins of Paris.

FRONTENAC, *frohNt nak',* LOUIS DE BAUDE, Comte de (about 1620–1698), a French soldier, one of the early governors of New France in America. He had served with distinction in Italy, Flanders and Germany before he was made governor of New France in 1672. The explorers Joliet, Marquette and La Salle were encouraged by him, and he established a number of strong military posts. Despite the fact that New France prospered under his rule, he was recalled in 1680, but nine years later he was reinstated. During King William's War with the English he succeeded in forcing the English fleet to retreat from before Quebec in 1690. Another event of his second administration was a struggle with the Iroquois Indians of New York, whom in 1696 he compelled to sue for peace.

FROST, the name given to the state of the weather when the temperature is below the freezing point of water; also the name given to the moisture condensed from the atmosphere, when the dew point is below 32° F. Frost is not frozen dew, but vapor frozen as it condenses. It is generally seen most profusely in spring and autumn, because at those times, while, on clear nights, the cold is sufficient to freeze the vapor, the days are at the same time sufficiently warm to cause a very considerable quantity of moisture to evaporate into the air. Frost is very destructive to vegetation, owing to the fact that water, which is generally the chief constituent of the juices of the plants, expands, when freezing, and bursts, thus destroying the minute cells of the plant. The subject of protection from frost has been given especial attention by the United States Weather Bureau, and the results are summarized in a bulletin entitled *On Frost Protection.* See Dew.

FROST'BITE, one of the effects of severe cold on some part of the body. Chilblains are mild cases of frostbitten hands and feet. The part affected turns purplish red, it swells, and at times gives rise to pain or an itching sensation. The simplest treatment of light frostbite consists in coaxing back the vitality of the part affected by means of gentle rubbing with snow, ice or cold water. The return of blood brings heat and fever, which may be very severe if the return is sudden. Hence, cold applications should be used before warm ones. If the freezing has been very severe or long-continued, the parts may die, decay and slough off. In such cases prompt surgical treatment is necessary.

FROUDE, *frood,* James Anthony (1818–1894), an English historian and miscellaneous writer. He was educated at Westminster School and at Oxford and after his graduation became engaged in the Tractarian movement (see Tractarianism), as advocated by Newman. He even took orders in the Church, but resigned before long and gave himself up to historical study. Between the years 1856 and 1869 appeared his great work, *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada,* which was very popular, but received only doubtful approval from historians. He was elected rector of Saint Andrews University in 1869, traveled in the United States in 1872 and aroused considerable opposition by his lectures on the Irish question. Later he traveled in South Africa, Australia and the West Indies and gave accounts of his journey in lectures and books. Carlyle appointed Froude his literary executor, and after Carlyle's death Froude published *The Reminiscences of Carlyle, Letters and Memorials of Jane Welsh Carlyle* and *Thomas Carlyle: a History.* These provoked an extraordinary amount of interest and controversy, because of the unreserved accounts they gave of the life of the Carlyles. Among Froude's other works are *The English in Ireland in the Eighteenth Century, Life of Lord Beaconsfield* and *Life and Letters of Erasmus.*

FRUITS, *frutes,* a term which in the popular sense is applied to the luscious food products of a large group of trees, shrubs and bushes. In botany the word refers to the seed of a plant and the parts which cover it. The most important fruits include the apple, plum, peach, pear, orange, banana, cherry, fig, grape, date, lemon, berries and melons. The cultivation and marketing of fruits constitute an industry of great importance in the United States and Canada; the former country exports each year fruits valued at more than $31,000,000.

Fruits are eaten both raw and cooked, and they are dried, canned, preserved and used in making butter, jam, jelly and marmalade. Fresh fruits are valuable as food, because they contain acids and salts that are of benefit to the system, and because their agreeable taste, flavor and appearance have a stimulating effect on the digestive organs and on the appetite. Fresh fruits also contain a large amount of water, and are mildly laxative. Care should be taken not to eat unripe fruits or those partially decayed. Dried fruits have a higher percentage of nutritive content than have fresh fruits, and the amount of sugar in fruit is increased by canning or preserving operations.

Related Articles. For descriptive matter on the various fruits consult the following titles:

Alligator Pear
Apple
Apricot
Banana
Bergamot
Blackberry
Breadfruit
Casaba Melon
Cherry
Citron
Cocoanut
Crab Apple
Cranberry
Currant
Date
Fig
Gooseberry
Grape
Grapefruit
Guava
Huckleberry
Juneberry
Kumquat
Lemon
Loganberry
Loquat
Mango
Melon
Mulberry
Muskmelon
Nectarine
Olive
Orange
Papaw
Peach
Pear
Persimmon
Pineapple
Plum
Pomegranate
Prune
Quince
Raspberry
Strawberry
Watermelon

FU-CHOW, or **FOO-CHOW,** China, a very old and prominent city, capital of the province of Fukien. It is on the Min River, about thirty miles from its mouth, and is one of the five Chinese ports thrown open to foreign commerce by the treaty of 1843. The trade is extensive, the chief exports being tin, timber, matches, cotton goods and fruits. Fu-chow has a large naval arsenal, government shipyards and dry docks. The city is enclosed within a wall twenty-five feet high and is entered through seven gates guarded by watchtowers. Connecting it with a densely-populated island is a bridge 1,350 feet long, called the "Bridge of Ten Thousand Ages." Within the city large banyan trees ornament the gardens and squares. Population, about 700,000.

FUCHSIA, *fu'she ah,* a genus of beautiful flowering shrubs, named after the discoverer, Leonard Fuchs, a German botanist. There are about fifty species, natives of South America, Mexico and New Zealand, but now worldwide in cultivation. The gracefully-drooping, jewel-like blossoms, with pearly and amethystine petals and dangling, stamens and pistils, have appropriately been called *ladies' eardrops.*

FUEL, as generally considered, is any plentiful substance that will unite with oxygen and burn, to produce heat (see COMBUSTION). The most important fuel materials are solids, as coal and wood and their derivatives, coke and charcoal. Peat is also extensively used in countries where peat bogs are numerous, particularly in Ireland. There are many peat bogs in the United States and Canada, but they need not be utilized for fuel for many centuries, if ever. In great industrial countries coal and coke are the usual fuels, but wood continues to be most used wherever there remain great forests.

The liquid fuels are petroleum, kerosene, gasoline, various oils and alcohol. Petroleum is employed on the most modern war vessels and on a few great ocean liners; gasoline and kerosene particularly in automobiles and in all other internal combustion engines. Alcohol is largely used in the experimental sciences. Bricks made of coal dust mixed with a binder of tar or pitch, and called *briquettes,* are employed quite extensively in Europe, but conservation of this kind has not yet been introduced to any great extent in America.

Gaseous fuels are now extensively employed for many purposes. Where natural gas is obtainable it furnishes fuel for manufacturing and for heating of buildings. Manufactured gas serves almost entirely for cooking in cities.

Related Articles. Consult the following titles for additional information:

Charcoal
Coal
Coke
Gasoline
Peat
Petroleum

FUGITIVE SLAVE LAWS, in United States history, two statutes providing for the return of slaves who had escaped from one state to another. Most of the colonies had laws guaranteeing the return of fugitive slaves. The Ordinance of 1787 contained a clause to that effect, and the Constitution specified that slaves escaping into a free state should be delivered to their owners. Congress in 1793 passed an act allowing the owner of a slave, by making an affidavit before a Federal judge, to secure a warrant for his arrest and removal. The slave could not testify in his own behalf. The abuses of this law led to a demand on the part of the North for an amendment requiring more evidence for the granting of a warrant, and this led to the passage of personal liberty laws by many Northern states, forbidding state officials to help in reclaiming alleged fugitives. These laws were declared constitutional by the Supreme Court. In 1850, among the compromise measures passed (see COMPROMISE OF 1850) was a fugitive slave law, placing in the hands of Federal officials the whole process of reclaiming fugitive slaves, adding many officials to the service, inflicting severe penalties for violation and declaring bystanders who refused to assist a government official guilty of treason. The owner's oath was sufficient evidence, and he could take this oath before a court in his own state. The passage of this law was one of the most important incidents which led to the CIVIL WAR.

FUJIYAMA, *foo je yah'mah,* or **FUSIYAMA,** the "Peerless Mountain" of Japan, whose snow-covered summit, bathed in clouds, is visible in clear air for a hundred miles. Fujiyama is a dormant, cone-shaped volcano. It is on the island of Hondo, sixty miles west of Tokyo, and is the highest summit in Japan, with an elevation of 12,400 feet. This volcano, revered as the sacred mountain of the people, has been inactive since 1707.

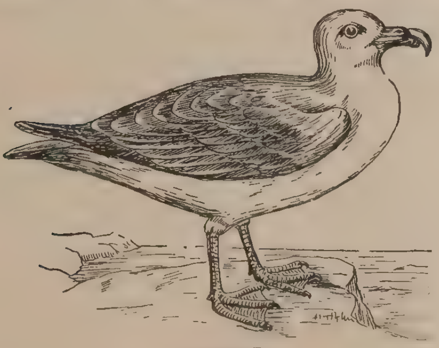
FUL'GURITE, a term derived from the Latin word *fulgur,* meaning *Lightning,* and applied to any rocky substance which has been transformed by lightning into impure glass. When lightning strikes the ground it penetrates some distance and the intense heat melts the loose rock and sand through which it passes, fusing it into a vertical glass tube. Fulgurite is very rare.

FULL'ER, Margaret. See Ossoli, Sarah Maragaret Fuller.

FULLER, Melville Weston (1833–1910), an American Chief Justice, was born in Augusta, Me. At the age of twenty he graduated at Bowdoin College. He studied law at Harvard and was admitted to the bar in his native city in 1855. He became editor of the Augusta *Age,* but in 1856 moved to Chicago, where he practiced law for thirty-two years. In 1862 he was a member of the Illinois constitutional convention, and the following year he was elected to the state legislature. He was a member of the Democratic national conventions from 1864 to 1880, inclusive, but withdrew from active politics in the latter year. On April 30, 1888, he was appointed Chief Justice of the United States Supreme Court by President Cleveland and served twenty-two years. In 1899 he was one of the arbitrators of the Anglo-Venezuelan dispute.

FULLER'S EARTH, a fine grained mineral substance, resembling clay. It is compact, but friable, and feels soapy to the touch. Silicon, aluminum, flourin, calcium and manganese are among its constituent elements. It was formerly used by fullers as an absorbent of grease and oil in cloth, hence the name. Fuller's earth is to-day used chiefly in the filtration of mineral oils and for decolorizing certain vegetable oils. Formerly England was the chief source of supply for America, but within recent years deposits of this earth have been found in several localities in the United States.

FUL'MAR, the name of several species of petrels. The common northern fulmar inhabits the northern seas and is plentiful on the shores of the Faroe Islands, Iceland, Greenland and around Saint Kilda, off the coast of Scotland. On the American coast it comes as far south as Massachusetts. It is about the size of a duck, is gray above and white beneath, with snow-white head, neck and tail. The birds are especially valuable for their feathers, and for their oil, which forms an important commercial product. Hunters make perilous descents by ropes from the summit of precipices to capture them. The giant fulmar, remarkable for its size, is found in the Pacific Ocean. Another species, the slender-billed fulmar, is found on the Alaskan coast of Bering Sea. See Petrel.



FULMAR

FULMINA'TION, a term used in chemistry to denote explosion of certain compounds by heat or percussion. *Fulminates* are explosive compounds consisting of fulminic acid and various bases, such as gold, mercury, platinum and silver. They are used as priming in percussion caps to cause the explosion of gunpowder in cartridges and shells.

FUL'TON, N. Y., a city in Oswego County, twenty-five miles northwest of Syracuse, on the Oswego River, the Oswego Canal and the New York Central, the Lackawanna and the New York, Ontario & Western railroads. It has a large cheese trade and manufactures of paper, woolens, infants' food and machinery. It was settled about 1791. A Federal building was erected in 1915. There is a Carnegie Library. Population, 1910, 10,480; in 1920, 13,043.

FULTON, Robert (1765–1815), an American engineer, famed for his achievements in practical steam navigation. Though he was not the first to experiment with steam power (see Fitch, John), he is honored as the inventor of the first successful steamboat. Fulton was born at Little Britain, Pa. He adopted the profession of portrait and landscape painter and in his twenty-second year proceeded to England for the purpose of studying art under West. There he became acquainted with the Duke of Bridgewater, Earl Stanhope and James Watt and was led to devote himself to mechanical engineering. In 1794 he took a

ROBERT FULTON

patent for a double-inclined plane, which was intended to supersede locks on canals, and he also patented a mill for sawing marble, machines for spinning flax and making ropes, and a dredging machine.

In 1797 he went to Paris, where he produced the first panorama that was exhibited there, and also devoted himself to the invention of torpedoes for naval warfare. He also was successful after a few trials in introducing a boat propelled by steam upon the Seine. During a visit to Scotland he had seen and obtained drawings of the *Charlotte Dundas,* a steam vessel which had plied with success on the Forth and Clyde Canal. Returning to America in 1806, he built a steamboat, the *Clermont,* of considerable dimensions, which began to navigate the Hudson River in 1807. Its progress through the water at the time was five miles an hour. His reputation as an engineer and inventor was now firmly established, and he was employed by the United States government on various engineering works. In 1814 he constructed the first war steamship and was engaged upon an improvement of his submarine torpedo when he died. See SHIP.

FUMIGA′TION, a method of disinfecting houses or garments by the use of fumes. Sulphur, formaldehyde and chlorine gas are among the agents employed, but formaldehyde solutions are the most desirable because they have no injurious effects on silver or other metals liable to tarnish. A room which is fumigated must be kept closed for six hours, after which it should be thoroughly ventilated and sunned. See FORMALDEHYDE.

FUNDY, BAY OF, a large inlet of the Atlantic Ocean, on the coast of North America, between Nova Scotia and New Brunswick. It is about 100 miles long and from thirty to fifty miles wide. At its inner extremity it divides into Chignecto Bay and Minas Channel and Basin. At its entrance are Grand Manan and other islands. This bay receives the Saint John and Saint Croix rivers. It is noted for its impetuous tides, which rush in with great force and often rise to a height of more than fifty feet.

FUNGI, *fun′ ji,* a general name for a class of parasitic plants which, having no chlorophyl (the green coloring matter by means of which plants assimilate atmospheric oxygen), must feed on other plants, or on animals, alive or dead. There are about 150,000 fungi, only a third of which have been described. They may be roughly classified as belonging to two groups: the *saprophytic* fungi, which live on dead or decaying organisms; and *parasitic* fungi, which implant their suckers or roots into the cells of living plants and draw nourishment therefrom. Some are microscopic in size. They thrive wherever they can find substance,—in the air, in the soil, in exposed water. Some species are beneficial to man, but others are destructive.

Related Articles. Consult the following titles for additional information:

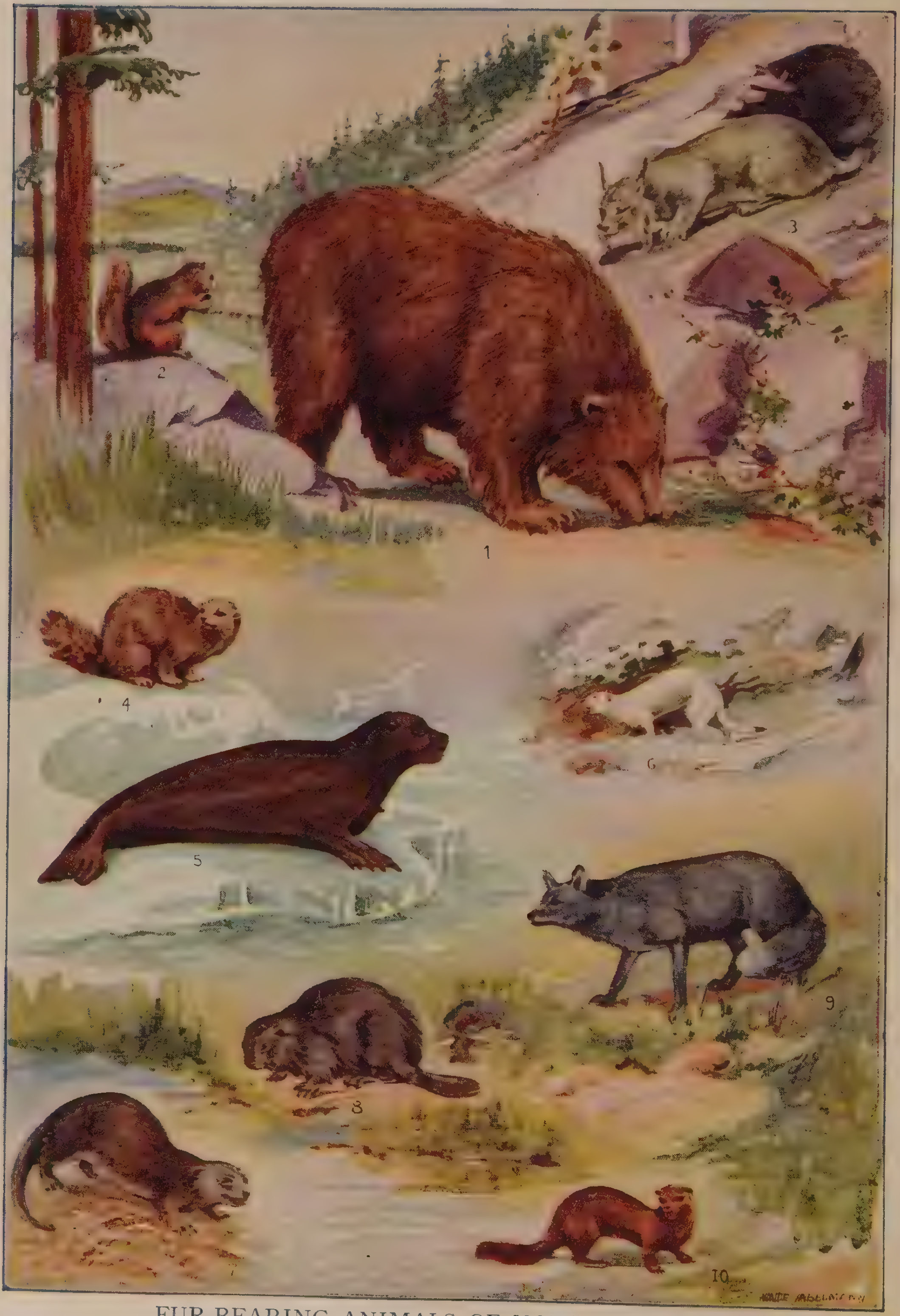
Bacteria and Bacteriology
Mildews
Mushrooms
Rusts
Yeast

FUNGICIDES. See INSECTICIDES AND FUNGICIDES.

FUNNY BONE, the name ignorantly applied to the slightly-protected ulnar nerve in the arm, close to the humerus. A feeling similar to an electric thrill passes along the arm to the finger tips when the nerve receives a sudden blow.

FUN′STON, FREDERICK (1865–1917), an American soldier who became one of the Spanish-American War heroes through his capture of Aguinaldo. He was born at Carlisle, Ohio, was graduated from the high school at Iola, Kan., and after teaching a short time entered the state university at Lawrence. Having made important researches in botany, he was appointed in 1895 as a commissioner to explore Alaska and report on the flora of the country. In 1896 he took part with the insurgents in Cuba under General Garcia. When the Spanish-American War began Funston became colonel of the Twentieth Kansas Volunteers and was ordered to Manila. Soon he was made brigadier-general of volunteers for bravery, and in March, 1901, he led a party of soldiers into Northern Luzon and captured Aguinaldo, the leader of the insurgents. For this achievement President McKinley made him a brigadier-general in the regular army.

At the time of the San Francisco earthquake and fire in April, 1906, General Funston had charge of the military forces in the city. In 1914 he was in command of the United States troops at Vera Cruz, Mexico, and was made major-general the same year. In 1916 he was placed in command of the troops along the Mexican border, and in February, 1917, died suddenly in San Antonio. Tex. In the campaign last noted, General Pershing was second in command.



FUR-BEARING ANIMALS OF NORTH AMERICA

1, Brown Bear.
2, Squirrel.
3, Lynx.
4, Sable.
5, Seal.
6, Ermine.
7, Otter.
8, Beaver.
9, Silver Fox.
10, Mink.

Ermine (winter coat)

FUR AND FUR TRADE. When mother or sister clothes herself in a garment of seal, sable or beaver she little realizes how severe has been the labor of man which makes such warm and beautiful clothing possible. The more precious the skin from which the coat is made, the greater has been the energy and the greater the suffering and endurance; for the finest skins from which clothing is made come from the most northerly regions and are secured in the very coldest weather, in the silences of the trackless north.

Even under the Arctic Circle there are periods of comparative warmth; the hunter and trapper would like to hunt the fur animals then, but he knows that their summer coats are not so fine, the fur not so thick and the color in most cases not so desirable. When the cold is so intense as to be almost unbearable the little animals put on their warmest raiment; the fur is long and fine and soft and thick down is found close to their bodies. This extra covering adds value to the pelt. It is during this season that the trapper works hardest, seeking the otter, beaver, ermine, marten and sable, which are the rarest and most desired, and the mink, muskrat, fox bear, wolf, etc., which also yield him a good portion of his profit. The skin of the silver fox has become so rare and so valuable that to-day these little animals are raised on farms and a wonderfully profitable industry has been developed (see FUR-FARMING, below).

The hunters and trappers have little work to do in preparing their catch for the market. They stretch the skins upon boards to dry them thoroughly, after which they are shipped to the buyers. The fur dresser, on receiving the skins, softens them, scrapes off the pieces of flesh that may remain, and cleans them. Then, after the fur has been combed and the coarser hairs removed, the skin is ready for the cutters and the finishing tailors, who line them and produce the completed garments.

The warmer climates also produce some good furs of a less expensive variety. The ingenuity of man, too, makes it possible to use the pelts of the commonest and most despised animals. These are employed in making imitations of the expensive skins, and uninformed people are not able always to detect the difference between the imitation and the real. For the cheaper grades the skins of moles, muskrats, skunks, cats, rabbits, squirrels and even rats are employed, as named below:

Trade Names. The following list gives some of the common substitutions, both true and trade names:

REAL NAME	TRADE NAME
House Cat	Genet
China Sheep (short hair)	Patagonian Bison
Coney	American or Hudson Bay Sable; Electric or Near Seal
Coney with black tips inserted	Ermine
Dog (Black Manchurian)	Chinese Wolf
Fox, White, dyed	Blue Fox (This is an imitation)
Fox, red, dyed black and pointed with white Badger hair	Pointed Fox
Goat	Bear or Blue Japanese Wolf
Hare	Black Lynx
Kid	Persian Lamb or Broadtail
Marmot	Brook Mink or Sable
Mink	Sable
Muskrat	Russian Otter, River Mink
Muskrat (with long hairs drawn)	Hudson, Red River or Aleutian Seal
Nutria or Coypu Rat (natural)	Beaver or Otter
Nutria (dyed and long hairs pulled)	Russian Otter, River Mink
Opossum (sheared and dyed)	Beaver, Skunk
Opossum, Australian	Adelaide Chinchilla
Otter (pulled and dyed)	Sea
Rabbit, according to process of preparation:	Seal, Hudson Seal, Electric Seal, Cape Seal
Ringtail Cat	Kolinsky
Sheep (dyed and acid curled)	Astrakhan
Skunk	Black Marten, Alaska Sable
Wallaby	Australian Fisher, Koala
Wolf, pointed with white badger hair	Pointed Wolf

Sea Animals. Reference thus far has been made to land animals only. The seal skin, for many years the royal fur for ladies' wraps, comes from the fur seal, a water animal, whose story is told in the article SEAL, subhead *Fur Seal.* The seal skin is not the most expensive skin. First place is held by the silver fox; the sable, too, used in the robes of kings and princes, is more expensive than the seal, for the sable is small and rare, and many pelts are required for a robe.

Comparative Values. No definite values can be placed on the skins as they come from hunters and trappers, but in normal times the following prices are the average:

Fox, silver, $1,200 to $5,000
Sea Otter, up to $3,000
Sable, up to $50 or $60
Otter, $10 to $35
Lynx, $5 to $35
Marten, $5 to $20
Seal, $5 to $20
Beaver, $5 to $25
Civet, 25 to 50 cents
Wolf, $5 to $10
Chinchilla, $4 to $12
Mink, $3 to $10
Fox, red, $1 to $8
Raccoon, $1 to $5
Skunk, $1 to $3
Ermine, 25¢ to $2.50
Marmot, 25 to 60 cents
Squirrel, 5 to 15 cents
Muskrat, 10 to 50 cents

Fur Farming. The great demand for pelts of the black and silver-tip fox prompted the Canadian government to encourage the establishment of "farms" for rearing these little animals. The industry was successfully established in Prince Edward Island, and later extended to Nova Scotia and Quebec. One reason for the popularity of these skins is that they cannot be imitated by even the cleverest workmen. So great is the desire on the part of the rich to possess wraps made from these skins that $4,000 is not considered a high price to pay for a single pelt. One pair of the best specimens of silver-tip foxes for breeding purposes is considered cheap at $30,000.

In Canada and the United State, also, there are many skunk "farms," and there have been successful efforts to raise minks and muskrats in captivity.

Historical. The fur trade has given rise to several great trading companies. The French early took up the fur trade in Canada, and their chain of forts and trading posts at one time extended from Hudson Bay to New Orleans. Quebec and Montreal were at first trading posts. In 1670 Charles II granted to Prince Rupert and others a charter empowering them exclusively to trade with the Indians of the Hudson Bay region.

A company, then and after called the Hudson's Bay Company (which see), was formed, which for a period of nearly two centuries possessed a monopoly of the fur trade in the vast tract of country known as the Hudson Bay Territory. In the winter of 1783–1784 another company was formed at Montreal, called the Northwest Fur Company, which disputed the right of the Hudson's Bay Company and actively opposed it. After a long and bitter rivalry the two companies united in 1821, retaining the name of Hudson's Bay Company. The monopoly which had hitherto been enjoyed by the original company about Hudson Bay was not much extended; but in 1868 an act of Parliament was passed to make provision for the surrender, upon certain terms, of all the territories belonging to the company and for their incorporation with the Dominion of Canada. In 1869 the surrender was carried out, Canada paying $1,500,000 to the company by way of compensation.

The trade in furs conducted by citizens of the United States has been extensive, but it has been in a greater degree the result of individual enterprise than of the management of gigantic corporations.

In the Old World Russia and Siberia yield great quantities of furs, as do the Scandinavian countries. Southern Germany, the Balkan countries, Turkey and parts of Africa also produce many of the cheaper varieties.

FURIES, *fu'riz,* known also as the Eumenides or the Erinyes in Greek mythology, were representatives of the mighty powers in mythology who avenged such crimes as murder, perjury or filial ingratitude. It was generally believed that there were three of these goddesses, though Aeschylus in his tragedy of the *Eumenides* introduced fifteen. These terrible sisters pursued all criminals and drove them mad with remorse. So gerat was the fear of them that the ancients did not dare speak of them as the Erinyes, which meant the *angry goddesses,* but used the name *Eumenides* (gracious ones), in order to propitiate them.

FUR'LONG (furrow-length), an English measure of length, divided into 40 rods, poles or perches, and equal to 220 yards, the eighth part of a mile. The word is little used in America.

FURNACE, *fur'nase,* a device for heating dwelling houses, churches and other buildings, and for developing heat to be used in smelting ore, making glass, baking pottery and heating boilers, and for other industrial purposes. The ordinary furnace is an enclosure of brick, earthenware, metal or other material, in which is burned coal or coke. Those employed in smelting have an arrangement by which a strong draft of air is forced through the fire; these furnaces are known as blast furnaces (see BLAST FURNACE). A *reverberatory* furnace is one in which the flames, in passing to the chimney, are thrown down by a low arched roof upon the object which it is intended to heat. These furnaces are used in the manufacture of wrought iron and steel (see IRON). A modern development of furnace making is the electric furnace, which generates a heat so intense that it can produce carborundum, the hardest manufactured substance known. The ordinary furnace used for warming buildings is practically a large stove, enclosed in a jacket. The air is admitted to the jacket near the ground, and as it rises is warmed by coming in contact with the furnace. It passes out through pipes at the top and is conveyed to different parts of the building.

For small homes the pipeless furnace has been found very practicable and economical. The furnace is placed directly beneath the center of the house, and the furnace casing is run straight up to a large register directly above. The warm air will flow through this register to the rooms on the first floor, provided these rooms all open into each other. Registers are placed in the ceilings of the rooms to permit the passage of warm air to the floor above. (See HEATING AND VENTILATION.)

FUR'NESS, HORACE HOWARD (1833–1912), an American Shakespearean scholar. He was born in Philadelphia, and was educated at Harvard College and at Halle in Germany. After studying law he was admitted to the bar in 1859. The work, however, which gained for him a prominent place in American letters is the *Variorum Shakespeare,* a work which he left unfinished, but which was continued by his son, Horace Howard Furness, Jr. Furness received honorary degrees from Harvard, Yale and Columbia universities, and was made a member of the American Academy of Arts and Letters. One of his sons is William Henry Furness, 3d, ethnologist and author.

FURNITURE. People of the modern age use a far greater variety of household articles than did their ancestors. In ancient times and during the Middle Ages a house was considered furnished if it contained chairs, a couch, beds and something which served for a table. Even the nobility of medieval Europe lived in castles that would seem very dismal and bare to one accustomed to the comforts of a well-appointed modern home. Simplicity in furnishing the house still prevails in Japan, where screens, mats and pictures are the chief articles of furniture, but in Europe and the Americas the reverse is true.

Interest in beautiful furniture was awakened in Europe during the Renaissance, and in France, Italy and England cabinetmaking developed as one of the fine arts. England produced, during the period of the four Georges (1715–1830), three masters of furniture designing—Thomas Chippendale, George Heppelwhite and Thomas Sheraton. Chippendale's name is associated with chairs having curved (cabriole) legs and latticework backs of the most exquisite design; and with china cabinets, bookcases with glass fronts, writing desks with glazed doors, and elaborately decorated settees. The sideboard of the modern English type is the creation of Heppelwhite, and he was especially skilled in the use of inlay and veneers. The special contribution of Sheraton was hand-painted furniture. He produced some of the most beautiful boudoir furniture of his time.

Within recent years the plain, substantial mission furniture and its modifications have become very popular, and there has also been a revival of interest in furniture of previous periods, such as "Queen Anne" dining room sets, and "Georgian" chairs. Unless one is able to afford genuinely artistic furniture, of standard designs, it is better to limit purchases to plain and substantial articles. The cheap, highly ornamented furniture put out by numerous companies is neither beautiful nor practicable.

The United States is one of the leading furniture-manufacturing countries, with a yearly output valued at about $371,000,000. To American ingenuity are due the rocking chair, the folding bed and the chiffonier. New York produces more furniture than any other American city; Chicago is second, and Grand Rapids (Mich.) is third, in production.

FUR SEAL. See SEAL, subhead *The Fur Seal.*

FUSE, *fewz,* a device for igniting explosives or other combustible mass, slowly and without danger to the person lighting it. Fuses are used in blasting and in discharging bombs. In blasting, the fuse is either a tape or cord saturated with some inflammable compound or a tubular cord containing in its center a small quantity of gun powder or other combustible material. In blasting operations to-day the explosive is usually ignited by means of electricity. Several sorts of fuses are used for explosive shells, or bombs. A *concussion* fuse is one that is ignited by the shock caused when the projectile strikes; a *percussion* fuse is ignited by the impact of the blow when the bomb hits. Quite different from these two types of fuse is the time fuse, a mechanical fuse which is timed to produce an explosion at the end of the number of seconds or minutes it is estimated it will take the shell to reach the object against which it is fired.

FU′SEL OIL, an oily impurity frequently found in spirits distilled from fermented barley, rye, potatoes, beet root, malt and other substances. It is much more intoxicating in its effect than ordinary alcohol, and is poisonous. Fusel oil can be removed from alcohol by filtration through charcoal, by distillation, or by a combination of the two processes. The oil is about six times as valuable as the alcohol from which it is isolated. It is used in preparing artificial fruit essences and in the manufacture of alkaloids.

FUSING, *fuze′ing,* **POINT**, the degree of temperature at which a substance melts or becomes fluid. This point is very different for different substances. Potassium fuses at 136° F., bismuth at 504°, lead at 619°, zinc at 680°, silver at 1832°, gold at 2282°. Malleable iron requires the highest heat of a smith's forge, 2912°; while cerium, platinum and some other metals are infusible in the heat of a smith's forge, but are fusible before the oxy-hydrogen blow pipe and in the electric furnace.

FUSION, *fu′zhun,* in science is another term for melting. The fusing point for a solid substance is that temperature at which it becomes liquid. That for ice is 32° F., and that for platinum is 3231° F. Solidified mercury melts at a temperature of –40°F. Metallic mixtures capable of being melted are known as *fusible metals.*

In politics the term is applied to the union of two or more political parties in an election. Fusion is employed, for example, when two parties unite on a single candidate in order to insure the defeat of a third-party candidate.

G

G, the seventh letter in the English alphabet. The Roman alphabet originally contained no such character, the hard *c* sound serving where the *g* came to be used later. *G* always has the hard sound, which is its earliest sound, at the beginning of words of English origin, before the vowels *a*, *o* and *u* and at the end of a word. The soft sound, which is identical with that of *j*, is found usually before *e*, *i* and *y*. In form, also, *G* is a modification of *C*.

In music, *G* is the fifth note of the diatonic scale of *C*.

GABERS, *ga'burz*. See GHEBERS.

GA'BLE, the triangular part of an outside wall at the end of a building, extending from the eaves to the ridge of the roof. It did not come into general use until the Romanesque period of architecture in the Middle Ages, when it was common in the formation of the summits of church façades. It was also used as a decorative feature in the architecture of residences. The development of tracery in Gothic architecture led to the use of highly decorated gables as ornaments over doorways, windows, pinnacles and other parts of buildings. In the towns of Belgium and Germany to-day ornamental gables are in use in houses to a great extent.

GA'BRIEL, the name given to that one of the archangels whose duty it was to announce to man the will and purpose of God. He appeared to Daniel as the interpreter of a vision, *Daniel* VIII, 7; to Zacharias as the herald of the birth of John the Baptist, *Luke* I, 19, and to Mary as the herald of the birth of Christ, *Luke* I, 26.

GAD'FLY, or **HORSE FLY**, the name given to over a thousand different species of small flies which are troublesome pests in the woods during the summer months, particularly near water, for they are great drinkers, as a rule. The common black gadfly, which is found in many parts of the United States, sucks the blood of man and other animals through its sharp proboscis and, if permitted, will lay its eggs in the wound, producing sores.

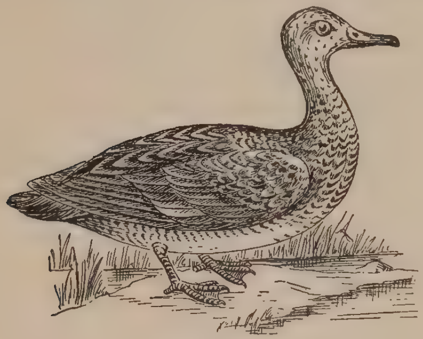
GADS'DEN, ALA., the county seat of Etowah County, fifty-six miles northeast of Birmingham, on the Coosa River and on the Chattanooga Southern, the Louisville & Nashville, the Nashville, Chattanooga & Saint Louis and the Southern railroads. The surrounding region is rich in minerals and timber. The industries include blast-furnaces and the manufacture of cars, lumber, machinery, doors, sashes, blinds and wagons. It was settled about 1845 and incorporated in 1867. There is a Federal building. Population, 1910, 10,557; in 1920, 14,737, a gain of 40 per cent.

GADSDEN PURCHASE, the name given to a tract of land in the southern part of New Mexico and Arizona, purchased from Mexico by the United States in 1854, through the agency of James Gadsden, United States minister to Mexico. It is bounded on the north by the Gila River, on the east by the Rio Grande, on the west by the Colorado and on the south by an arbitrary line. Its purchase settled a boundary dispute which had resulted from the Mexican War (which see). The average width of the territory purchased is about 120 miles, and it includes an area of about 45,535 square miles. The United States paid Mexico $10,000,000. The treaty was negotiated in 1853 and was ratified in the following year. It caused such opposition in Mexico that Santa Anna was banished.

GADSKI, *gaht'ski*, JOHANNA (1871-), a German dramatic soprano of the first order. She was born and educated in Prussia, and made her début in Berlin at the age of seventeen. Four years later she married

Herr H. Tauscher, an officer in the Austrian army. Her American début was made in 1895, at the Metropolitan Opera House, New York City, under the management of Walter Damrosch. In 1898 she became a member of the Metropolitan Opera Company, and has since enjoyed a popularity equaled by that of few other singers. Her beauty, dramatic talent and superb vocal gifts make her a commanding figure in the musical world. As an interpreter of Wagner rôles she has no superior.

GAD′WALL, a rather large fresh-water duck, common in the interior of the United States and breeding north of the latitude of Kentucky. It is a black and white duck, marked with brown, and is one of the favorite game birds.



GADWALL

GAEL, *gale,* the name of a branch of the Celts, inhabiting the Highlands of Scotland, Ireland and the Isle of Man. Gaelic is the name now generally restricted to that dialect of the Celtic language which is spoken in the Highlands of Scotland and is distinguished from Manx and Irish, the other two kindred dialects.

GAGE. See Gauge.

GAGE, Thomas (1721–1787), an English soldier and colonial governor of Massachusetts, born in Sussex, England. At the outbreak of the last French and Indian War, he was made brigadier-general and served at the head of a regiment of colonial troops. He was governor of Montreal in 1760, became major-general in the following year and at the end of the war was commander in chief of the British forces in America. In 1768 he was placed at the head of a British force in Boston, but returned to England in 1772. Two years later he was appointed military governor of Massachusetts and aroused bitter resentment by his vigorous enforcement of the Boston Port Bill and the Navigation acts. It was through his order to the troops to seize the military stores at Concord that the first battle of the Revolutionary War was fought. He commanded the troops at Bunker Hill, but was recalled to England in October, 1775.

GAINSBOROUGH, *gaynz′b′ro,* Thomas (1727–1788), an English painter, born at Sudbury, in Suffolk. He was one of the original thirty-six academicians. He rivaled Sir Joshua Reynolds as a portrait painter and showed no less originality in landscape. He painted portraits of Garrick, Mrs. Siddons, Pitt, Blackstone, Burke and many other notable people. One of his most celebrated productions is *Duchess of Devonshire,* which was bought originally for $305, but sold for more than $50,000 in 1876. Other paintings are *Boy Blue,* considered his greatest work, *Rustic Children, The Cottage Door* and *The Harvest Wagon.*

GAL′AHAD, Sir, in legends of the Holy Grail, the son of Launcelot and Elaine, the purest of the knights of the Round Table. He figures prominently in the quest of the Grail, though there are varying accounts of the legend, such as that given by Tennyson in the *Idylls of the King,* and the version of Sir Thomas Malory. The English poet Watts executed a beautiful painting of Sir Galahad in armor, his model for the subject being his wife, Ellen Terry. See Grail, The Holy.

GALAPA′GOS, a group of thirteen islands of volcanic origin, in the North Pacific Ocean, about 600 miles west of the coast of Ecuador, to which they belong. The total area is 2,400 square miles. Some of the group rise nearly a mile above sea level. Turtles are very numerous and form the principal commerce of the islands. Sugar is grown, and cattle are raised to some extent. The islands were explored by Darwin in 1858, and they have been visited by many naturalists, because of the interesting animal and vegetable life found there. Many forms are peculiar to the islands, and there are few species in common with the rest of South America.

GALATE′A. See Pygmalion.

GALATIA, *ga la′she ah,* the ancient name of an extensive region in Asia Minor, so called from its Gallic inhabitants, who settled there in the third century B. C. These were compelled by Attalus, king of Pergamos, to settle within well-defined limits. Galatia became a Roman province under Augustus and was divided into provinces by Theodosius. It was twice visited by the Apostle Paul, who later addressed one of his famous letters to the people of Christian churches in the region. It forms the ninth book of the New Testament.

Epistle to the Galatians, a letter of the New Testament, written by Paul to the Galatian churches, to warn them against those who were trying to influence them to adopt Jewish rites and to defend himself from the unjust criticisms being made. The letter is claimed by some to be earlier than those to the Thessalonians.

GAL'AXY. See Milky Way.

GAL'BA, Servius Sulpicius (3 B. C.–A. D. 69), a Roman emperor. He served as general in Germany and as proconsul to Africa, his services there obtaining him the honors of a triumph. He then lived in retirement till the middle of Nero's reign, when the emperor appointed him governor in Spain. Soon afterward, however, Nero secretly ordered Galba to be assassinated. Galba revolted, and on the death of Nero he himself was chosen emperor by the praetorian guards in Rome. He went directly to Rome, but soon made himself unpopular by cruelty and avarice, and was slain in the Forum.

GA'LEN, properly Claudius Galenus, (A. D. 130-200), a Greek physician, the world's supreme medical authority until about 1550. Among the many writings attributed to Galen are eighty-three treatises acknowledged to be genuine. The most valuable of his works were those dealing with anatomy and physiology, and he was the first to establish the consultation of the pulse in determining the nature of disease.

GALENA, or **LEAD GLANCE**, a widely-distributed mineral ore which is the chief source of lead. It contains about eighty-seven parts lead to thirteen of sulphur and some silver, antimony, zinc, iron and bismuth. Where the proportion of silver is high the ore is known as *argentiferous galena*, and it is worked with a view to extracting this metal. All galena is soft and brittle, with a bluish-gray luster, and is very heavy. It is usually found in caves or gash veins of limestone. In the United States it occurs in Illinois, Colorado, Idaho and Montana, and in smaller quantities in Iowa, Missouri and Wisconsin. See Lead.

GALENA, Ill., the county seat of Jo Daviess County, seventeen miles southeast of Dubuque, Ia., on the Galena River and on the Illinois Central, the Chicago & Northern and the Chicago, Burlington & Quincy railroads. Galena is well known for its part in the early history of the Middle West. It became the center of extensive lead and zinc industries, and was the home of General Grant in early manhood; his old home is yet here. The city contains a Federal building, a public library and Grant Park, with a statue of the general. The town was settled in 1827, and was chartered as a city in 1839. Population, 1920, 4,742.

GALESBURG, *gaylz'burg*, Ill., the county seat of Knox County, 163 miles southwest of Chicago, on the Atchison, Topeka & Santa Fé and the Chicago, Burlington & Quincy railroads. There are four interurban lines. The city has an attractive location and is the seat of Knox College, Lombard University, Saint Joseph's Academy and Saint Mary's Academy, and has a Carnegie Library, a state armory, an opera house, a Y. M. C. A. and a Federal building. The industrial establishments include railroad shops, stockyards, iron foundries, brickyards and manufactures of engines, wagons and agricultural implements. The place was settled in 1834 by New Yorkers and was named in honor of Rev. George W. Gale, who planned the town as the site for a theological seminary and a rallying ground for the "Free-Soilers" of the territory. Population, 1910, 22,089; in 1920, 23,785.

GALICIA, *ga lish'i a*, a province of the former Austro-Hungarian monarchy, occupying the northeastern part of that country. Czecho-Slovakia is on the south, Poland on the north, the Ukraine on the east, and the province of Silesia on the narrow western border. Galicia occupies the crescent-shaped area covering 30,308 square miles, and before the World War it had a population of 8,026,000. Lemberg (which see) is the capital city.

On the dissolution of Austria-Hungary, in the fall of 1918, Eastern Galicia, in which Ruthenians are the dominant element in the population, formed a separate state and joined the Ukraine. Western Galicia, which is dominated by Poles, formed an independent Polish state and united with the Russian Poles on the north. The Poles endeavored to prevent the secession of the Ruthenians, and the result was a protracted period of fighting, complicated by efforts of the Bolsheviki to gain control of affairs. In the end, Galicia became a very important part of the Polish Republic.

Galicia has in part an uneven surface, broken by spurs of the Carpathian Mountains. It has a continental climate, and as it is as far north as Northern Maine, the climate during much of the year is severe. The summers are short, though warm. Several of Europe's large rivers drain Galicia. The Vistula forms a part of its northern boundary, the Dniester extends southeast through half of the province, and several branches of these penetrate most of the other sections.

The greatest crop is potatoes; the second, rye. These are the two staple food products, but there are also raised large quantities of wheat, oats, barley and cabbages. Although largely an agricultural country, there are some valuable mineral products. All of Austria's petroleum was found here, and about one-eighth of the coal of old Austria-Hungary was taken from Galicia. The province has little manufacturing beyond that needed for home consumption.

The population was originally Germanic, but the German tribes were driven out by Poles and Ruthenians. Dissensions opened the way for the conquest of the district by the Hungarians, and later, the Russians. In 1340 Poland possessed the country, and it formed a part of that country until its partition in 1772. In that year it was annexed to Austria. Since then racial quarrels have frequently disturbed the section. The inhabitants, who are Russians, Poles, Slovaks, Bohemians and Ruthenians, did not accept kindly the rule of the empire, but it must be said that Galicia shared more fully in its own government than did any other Austrian province. In the World War, the Russians invaded Galicia twice, once taking the strongly-fortified city of Lemberg, but eventually being forced out by Von Mackensen's forces. See WORLD WAR; AUSTRIA-HUNGARY; UKRAINE, THE.

GAL'ILEE, in the time of Jesus Christ the most northern province of Palestine, bounded on the east by the river Jordan, on the south by Samaria, on the west by the Mediterranean Sea and Phoenicia and on the north by Syria and the Mountains of Lebanon. It was in a sense the cradle of Christianity, Nazareth, Cana, Capernaum, Nain and other places being intimately associated with the life of Christ. The inhabitants of this country, mostly poor fishermen, on account of their ignorance and simplicity of manners were despised by the Jews, who, by way of contempt, called Christians, at first, *Galileans*. At present Galilee is included in the province of Syria. See PALESTINE.

GAL'ILEE, SEA OF, anciently known as the LAKE OF GENNESARET, is an inland body of water in Central Palestine which will forever retain special religious associations. It is thirteen miles long and seven miles wide, is 682 feet below the surface of the Mediterranean Sea, and is traversed in its upper course by the River Jordan. It was known for a time as the Sea of Tiberias, after the building of the city of Tiberias on its shores. In the vicinity of this sea, particularly at the north, much of the public life of Christ was spent, and in his time there were nine prosperous cities on its shores. Seven of these have disappeared; Magdala and Tiberias, the other two, are now poor, crumbling villages.

GALILE'O (1564–1642), the popular name of GALILEO GALILEI, a most distinguished Italian philosopher and astronomer, born at Pisa and educated at its university. He was one of the great creators of experimental science. When he was nineteen years of age, the swinging of a lamp in Pisa cathedral led him to investigate the laws of the oscillation of the pendulum, which he subsequently applied in the measurement of time, and in 1586 the works of Archimedes suggested his invention of the hydrostatic balance. He later devoted his attention exclusively to mathematics and natural science and was made professor of mathematics at the University of Pisa and later held the same position in Padua, where he remained eighteen years. His lectures there acquired European fame; there he made the important discovery of the law regulating the motion of falling bodies. If he did not invent, he improved, the thermometer and made some interesting observations on the magnet. His most remarkable discovery was that of Jupiter's satellites, and he observed, though imperfectly, the rings of Saturn. He also detected the sun's spots and inferred, from their regular advance from east to west, the rotation of the sun and the inclination of its axis to the plane of the ecliptic. In 1610 Cosmo II, grand duke of Tuscany, appointed him grand-ducal mathematician and philosopher, and he lived sometimes in Florence and sometimes at the country seat of a friend, where he discovered the varying phases of Mercury, Venus and Mars. In 1611 he visited Rome for the first time, and was treated with great distinction. Four years later he again visited Rome, but this time was not so warmly received, as in the meantime he had published his work on the solar spots, in which he had advocated the Copernican system, in spite of the hostility of the churchmen. He was, in consequence, denounced as a propounder of heretical views. Some time afterward he wrote his most famous work and received Papal permission to publish it, but hardly had it been issued, when Pope Urban VIII, having been led to believe that Galileo had satirized him in this work, summoned him to Rome in 1623 to be tried by the Holy Office. Several writers asserted that Galileo was imprisoned for heresy; but most modern authors agree that although a sentence of imprisonment was pronounced upon him it was never enforced. His remains were buried in France.

GALILEO

GALL, *gahl,* Franz Joseph (1758–1828), the founder of phrenology, was born in Tiefenbrunn, Baden. He studied medicine and practiced at Vienna as a physician, where he made himself favorably known. After a series of comparisons of the skulls of men and animals, he was able to assign the particular location of twenty organs. He accompanied Dr. Spurzheim, to Paris, in 1807 where he published with Spurzheim, in 1810 and 1812, several books on the nervous system. See Phrenology.

GAL'LATIN, Albert 1761–1849), an American statesman and financier, born in Geneva, Switzerland. He received a thorough education in his native land and then emigrated to the United States, arriving in 1780. He entered business, but without success, was instructor in Harvard College for a time and then removed to Pennsylvania. There he became prominent as an earnest opponent of the Federal Constitution and served as an Anti-Federalist in the state legislature in 1793. He was elected to the United States Senate, but was forced to withdraw because he had not lived the requisite time in the United States. He labored earnestly to suppress the Whisky Insurrection. In 1795 Gallatin entered Congress, becoming a leader of the Republican party, and displaying preëminent ability as a judge of financial measures. Jefferson made him secretary of the Treasury in 1801. During his term he carried out Hamilton's policy, but instituted original reforms which decreased the national debt and placed the finances of the nation on a safe basis. He strongly opposed the War of 1812, labored earnestly to bring about peace and was a leading negotiator in the Treaty of Ghent. He then accepted the office of minister to France, which he filled until 1823. Three years later President Adams appointed him as minister to England, but after two years he resigned.

GALL, *gawl,* **BLADDER**, a pear-shaped sac, attached to the under side of the liver. It serves as a storehouse for the bile. The neck of this sac is connected with a tube called the *cystic duct,* which combines with the *hepatic duct* to form the common *bile duct.* During the interval between meals, the bile, which is continually being secreted by the liver, passes into the common bile duct to find the opening into the duodenum closed by its sphincter muscle; it is therefore forced into the gall bladder through the cystic duct, which has an opening into the common duct. It remains in the gall bladder till food enters the small intestines. By some reflex movement the bile is then discharged with force enough to open the sphincter. Gall stones are small, hard masses which sometimes form inside the gall bladder. When they pass through the bile duct into the intestine they cause agonizing pain. The condition sometimes requires an operation. See Bile.

GAL'LEY, a low, flat-built vessel, with one deck, once commonly used in the Mediterranean. It was navigated with sails and oars. The common galleys varied from 100 to 200 feet in length, those of smaller sizes known respectively as half-galleys and quarter-galleys. The larger ones carried as many as twenty oars on each side, each oar worked by one or more men, and they had commonly two masts and sails. These, however, were more fully developed in the kind of galley known as the *galleass,* which carried three masts, from 200 to 300 rowers and sometimes twenty guns. France formerly had a number of galleys for service in the Mediterranean, in which convicts were forced to labor, from which came the term *galley slave.* The term galley is also applied to the ships of the ancient Greeks and Romans, especially to their war ships, propelled by oars.

GALLI-CURCI, *gahl e cur′che,* AMELITA (1889–), a celebrated soprano, born of Italian and Spanish parentage at Milan. She studied piano, composition and harmony at the Royal Conservatory, Milan, and upon graduation at the age of nineteen was appointed a professor in that institution. As a vocalist she is self-taught. Her operatic début was made in Rome in 1909 as Gilda in Rigoletto. The following year she married Marquis Luigi Curci, a portrait painter, and in 1920 sought in Chicago a divorce from him. She made her début in the United States in 1916 with the Chicago Opera Association. Madame Galli Curci is a fluent linguist, speaking seven languages. Her voice has a perfectly pure range of three octaves. There is no more spectacular figure upon the operatic stage to-day than this singer, whose beauty and culture have made her a popular idol. In 1921 she was married to Homer Samuels, her accompanist.

GAL′LINULE, a name for certain water birds belonging to the rail family. Though not web-footed, they are good swimmers, for their toes are furnished with a narrow membrane. There are two American species. These are the *purple gallinule,* a bird of the Southern states, and the *Florida gallinule,* which ranges from Ontario to Brazil.

GALLIPOLI, *gal ip′o le,* a peninsula and town on the European side of the Dardanelles. The town (population 20,000) is relatively unimportant, except that Turkey used it as a base for its fleet. The peninsula guards the Dardanelles and has been the scene of battles and sieges. It was the gateway of the Turks when they entered Europe in 1357; the allied forces landed there in the Crimean War in 1854, and in 1915–1916 the entente allies in the World War were defeated at Gallipoli in their effort to conquer the Dardanelles and open the way for the capture of Constantinople. See WORLD WAR; DARDENELLES.

GALLIUM, *gal′i um,* a metallic chemical element, discovered by means of the spectroscope in 1875 by a Frenchman named De Boisbaudran. It was found in zinc ore from Pierrefitte, in the Pyrenees and was named after Gallia, the ancient name of Gaul. It is of grayish-white color, has a brilliant luster, and is melted by the mere warmth of the hands into a silvery-white liquid. Its general properties resemble those of aluminum.

GAL′LON, a unit of capacity in the English system of weights and measures, used chiefly for measuring liquids. It contains 231 cubic inches, being equal to a cylinder 7 inches in diameter and 6 inches high. It is equivalent to 3.7853 liters. In England an *imperial gallon* is also used, containing 277.274 cubic inches. A gallon is divided into 4 quarts, each quart into 2 pints and each pint into 4 gills. See WEIGHTS AND MEASURES.

GALLS, *gawlz,* unnatural growths on plants, usually caused by the presence of the young of insects. Occasionally galls are produced by fungoid growths, worms, bacteria, algae or slime molds. Important among the gall-producing insects are the Hessian fly, which is a destructive pest of North American wheat; the phylloxera, which attacks the grape vine; the clover-seed midge, and the gall-fly. The female of the latter deposits her eggs in the leaves and twigs of various plants, but when the young hatch in the tissue of the oak tree there are formed the galls of commerce, the white, green or blue "oak apples." These galls contain gallic acid, used in the textile and dyeing industries, in photography and in medicine as an astringent. Galls of this class used by American manufacturers are imported chiefly from China (see DYEING). Modern writing ink has as one of its ingredients an infusion of bruised galls (see INK).

GALS′WORTHY, JOHN (1867–), one of the foremost of present-day English novelists and dramatists. He is a realist and a pessimist, and many of his works deal with current social problems. His plays, nearly all of which have been produced, include *Justice, Joy, Strife, The Silver Box, The Pigeon, The Eldest Son* and *The Foundation.* Although his creed compels an unbiased and faithful picture of life, his style is unerringly artistic, and he never in his zeal as a reformer adopts the method of a propagandist. Besides his plays, Galsworthy has published many books in popular vein. Of the last the most important are *The Island Pharisees, The Man of Property, The Country House, The Patrician, In Chancery, Tatterdemalion, To-Let* and *Awakening.*

ALEXANDER GALT

GALT, Alexander Tilloch, Sir (1817–1893), a Canadian statesman. He was born in London, but emigrated to Canada at the age of eighteen. He entered the Canadian Assembly in 1849 as Liberal member for Sherbrooke County, Quebec, but he opposed the rebellion losses bill, the chief measure of his party. He retired from the Assembly before the end of the year, but reëntered it in 1853 and for twenty years was the leading representative of the English Protestants of Quebec. In 1858 he was called on to form a Ministry but declined. From 1858 to 1862 and again from 1864 to 1867 as Minister of Finance he did much to reduce the chaotic finances of Canada to order. To him are due the introduction of the decimal system of currency and the system of protection to Canadian manufacturers. He was one of the men whose influence led to the coalition Ministry of 1864–67. He became Minister of Finance in the first Dominion Ministry, but resigned after a few months. In 1877 he rendered brilliant service as Canadian representative on the Anglo-American Fisheries Commission at Halifax. He was Canadian high commissioner to Great Britain, 1880–1883, being succeeded by Sir Charles Tupper.

GALT, Ont., in Waterloo County, on the Canadian Pacific and Grand Trunk railways, thirteen miles from Berlin, fifteen miles from Brantford. Electric lines connect it with neighboring towns. The vicinity supplies large quantities of lumber, limestone and sand. The principal products of the city's factories are edge tools, knitted goods, safes, boots and shoes, flour and foundry products. There are several private schools. Population, 1921, 13.210.

GALTON, *gawl'ton,* Sir Francis (1822–1911), an English scientist, the cousin of Charles Darwin. He was born at Duddeston, Warwickshire, and educated at King's College, London, and Trinity College, Cambridge. His extensive travels in Africa led to works on the topography of Southwest Africa, and he published also *Meteorographica,* studies in meteorology which introduced the system of charting the weather which remains in use to-day. Most important of Galton's contributions to science, however, were his studies in heredity. He sought for the principles governing the inheritance of physical and mental traits, and founded the science which deals with the possiblity of improving the hereditary qualities of the human race. To this new science he gave the name of *eugenics,* which means "well born." His works treating of this subject include *Hereditary Genius* and *Natural Inheritance.* See Eugenics.

GALVANI, *gal vah'ne,* Luigi (1737–1798), an Italian physiologist and physicist, who discovered galvanism, so named in his honor. He was born at Bologna, and in 1765 was appointed professor of anatomy in the University there. In 1797 he was deprived of the chair for refusing to take the oath of allegiance to the Cisalpine republic, but was reinstated after a few months. Although he gained repute as an anatomist, his fame rests chiefly on his discoveries of the relation of electricity to animal functions, discoveries which started with the observation of the convulsive movement of some dissected frog legs in contact with an electrically charged scalpel. After a prolonged series of experiments he published the results of his findings in 1791. See Electric Battery; Galvinism.

GALVANIC BATTERY. See Electric Battery.

GAL'VANISM, a term formerly applied to current electricity, especially that arising from chemical action, as distinguished from that generated by heat or induction. The term is no longer in scientific use. See Galvani, Luigi; Electricity.

GALVANIZED IRON, a name given to sheets of iron coated with zinc. The iron is first cleansed by friction and the action of dilute sulphuric acid, and is then plunged into a bath, composed of melted zinc and sal-ammoniac. As the zinc cools, it forms in crystals on the surface, and this gives to galvanized iron its mottled appearance. So long as the coating is entire, and is not exposed to corrosive substances, galvanized iron is very durable. It is used for making cornices, jackets for furnaces, vessels for holding water, and occasionally as a roofing material. Drinking water should not be kept in galvanized iron vessels, because the zinc dissolves and poisons the water.

GALVANOM′ETER, an instrument for measuring the strength of a delicate electric current. While there are numerous patterns of galvanometer, all are constructed on the principle that an electric current will change the direction of a magnetic needle. The galvanometer consists of a magnetic needle delicately balanced over an electro-magnet. When a current is sent through the coils of the magnet, the needle is turned to the right or left, according to the direction of the current. The strength of the current is estimated by the number of degrees over which the needle moves.

GAL′VESTON, Tex., the county seat of Galveston County, on an island of the same name at the mouth of Galveston Bay, and on the Southern Pacific, the Gulf, Colorado & Santa Fé, the Missouri, Kansas & Texas and other railroads; there are also regular steamship lines to American coast cities and to all important foreign countries, and an electric road to Houston. It has wonderful palm trees and is world famous for its great sea wall. The city is the seat of the state university medical department, a Jesuit college, a Dominican convent and an Ursuline convent. The Ball High School is one of the greatest in the south. Prominent among semi-educational institutions is the Rosenberg Library which cost $150,000 and has an endowment of $400,000. Other important structures are the Sealy Hospital, the courthouse, the custom house and post office, the railroad station, the Y. M. C. A. building and several fine business houses. Among the latter should be mentioned the American National Insurance Building, the tallest building in the city. The Hotel Galvez, on the shore of the Gulf, is the finest resort hotel in Texas and one of the finest in the United States.

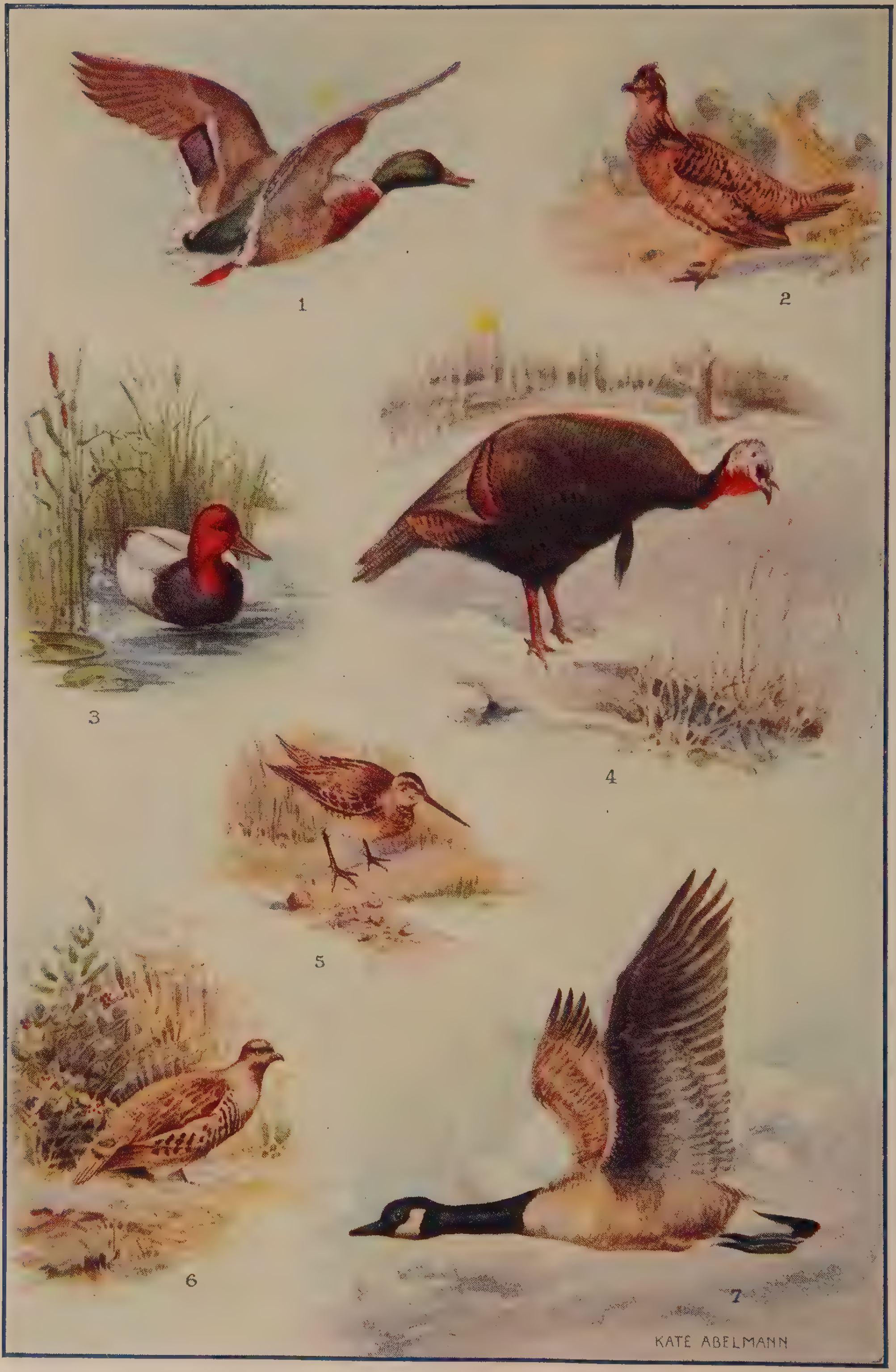
Among the industrial establishments are ice-plants, iron works, cottonseed oil mills, rice and flour mills and manufactories of cement, pipe, clothing, flour and various foods. The channel between the island and the mainland has been so improved by the Federal government that it now affords an entrance of twenty-eight feet of water into an excellent harbor, with a wharf frontage of over six miles. A magnificent causeway connects the island with the mainland. In 1919 the government established at Galveston a permanent hydroplane training station, to be housed in ten buildings, whose construction entails an expenditure of $2,000,000. The personnel will exceed 800 officers and men.

During the year 1905–1906 the city advanced to the second place among the exporting ports of the United States, and it has long occupied first place in exporting cotton. Other foreign exports are cottonseed oil, wheat, copper, iron ores, cattle and provisions.

The first permanent settlement was made here in 1837 and incorporation followed two years later. The city suffered from a big fire in 1885. In 1900 it was the scene of a terrible disaster from a hurricane, originating in the West Indies. About $18,000,000 worth of property was destroyed and about 6,000 lives were lost in the city and adjacent country. The city is now protected by a sea wall, completed in 1904, which forms the greatest structure of the kind in the world. It is 17,593 feet long, sixteen feet wide at the base and five feet at the top, and stands seventeen feet above mean low tide. Just after the great storm of 1900, this city originated and adopted the commission form of government, called at the time the Galveston Plan. Population, 1910, 36,981; in 1920, 44,255, a gain of 20 per cent.

GAMA, *gah′mah,* Vasco Da (1469–1524), the first mariner to sail around the Cape of Good Hope, and the discoverer of the sea route to India. He was born of a noble Portuguese family, and at an early age went to sea. In 1497, acting under a commission of the King of Portugal, he sailed on the great voyage of his life. On his return, he reported the boundless wealth of India, and the king rewarded him with rank of nobility and a pension. He made a second successful voyage, and in 1524 was made viceroy of India. He died in Cochin in the same year.

GAMA, *gah′ma,* **GRASS**, or **SESAME**, *ses′a me,* **GRASS**, an American grass, of which but two or three species are known. Because of its ability to endure a long drought, it is a valuable fodder grass in dry regions, and is cultivated especially in the



GAME BIRDS OF NORTH AMERICA

1—Mallard Duck. 2—Prairie Hen. 3—Canvasback Duck. 4—Wild Turkey. 5—Snipe. 6—Partridge. 7—Canada Goose.

Southwestern United States, Mexico, parts of Europe and Australia. It bears coarse, branching stems which reach a height of nine or ten feet, and its leaves are similar to those of corn.

GAMA'LIEL, a Jewish rabbi of the first century A. D., noted as the teacher of Paul during the latter's boyhood. Gamaliel was a moderate and liberal-minded man; as a member of the Sanhedrin he advised his fellow-members not to persecute those who were spreading Christ's teachings (see *Acts* V, 34). He is thought to have presided over the Sanhedrin for a number of years.

LEON GAMBETTA

GAMBETTA, Leon (1838–1882), a French statesman noted for his ardent devotion to republican principles. In 1869, having been elected by both Paris and Marseilles, he chose to represent the southern city in the Chamber of Deputies and showed himself an irreconcilable opponent of the empire and its measures, especially of the policy which led to the disastrous war with Prussia. When the Germans encircled Paris, he left that city in a balloon and set up his headquarters at Tours, from which, with all the powers of a dictator, he directed for a short time a fierce but vain resistance against the invaders. After the close of the war he held office in several short-lived Ministries, and in November, 1881, he became Premier.

GAM'BLING, a pastime involving the element of chance, with the hope of winning money. It is a form of amusement which has been greatly restricted by law. In consequence, public gambling is attended with the danger of arrest and punishment. Private gambling, difficult to locate, is widespread.

The commonest form of gambling is with playing cards, and the most popular gambling games are poker, rhum, fan-tan and bridge whist. Playing cards, however, are not the only resort of gamblers. Horse-racing is one of the most pernicious forms of gaming. Betting on horse races has become a vast business enterprise, though now greatly restricted through stringent laws. Another insidious form of gambling is on specially constructed tables, wheels, or boards. The most popular is possibly the roulette wheel, where a bettor's slight chance of winning money depends upon the turn of the wheel. The slot machine, where the bettor's chance of winning is as 2 to 5, with the odds against him, is another device to entrap the unwary.

GAME, from the viewpoint of the sportsman or professional hunter, includes those animals which are the objects of the chase and are hunted for their flesh, as distinguished from meat, fish and poultry. The game animals of the world are the wild animals. In Africa and some other parts of the world, lions, tigers, panthers, leopards, alligators and many other large animals are regarded as *big game,* though their flesh is almost never eaten. In the United States and Canada the only important big game animals are bears, moose, deer, antelopes, mountain sheep and goats. The buffalo was formerly one of the game animals, but is now almost extinct. Of the smaller animals, foxes, rabbits and hares are most common.

The game birds are more plentiful than the quadrupeds. An extensive list is not possible here; the most important are partridge, grouse, plover, quail, snipe, curlew, woodcock, rail, ducks, swans and geese. The term wild fowl is usually applied only to the last three. Among the common varieties of ducks are the mallard, redhead, canvasback, teal, pintail and wood duck. See color-plates, Game Animals, Game Birds.

Game Laws. In modern times the growth of population and the threatened extinction of all wild game has led to the passage of laws for the regulation of hunting, both to protect game from destruction and to protect persons in the legitimate enjoyment of such sport. Such laws have been passed from time to time in America ever since the landing of the Pilgrims, in almost every case for the purpose of protecting the game. Hunting and fishing are regulated chiefly by compelling the taking out of licenses, by limiting the number which each hunter may kill or may ship, by making more stringent the laws of trespassing and by forbidding the killing during the mating season and period of reproduction.

The chief subjects of such laws have been the deer, quail, grouse, prairie chicken, ducks and especially valuable or rare fish, such as trout and muskellunge. In almost every state of the United States and in every province of Canada, the killing of quail, grouse, prairie chickens, ducks, moose and deer is prohibited during certain seasons, varying according to the habits of the species of the several localities. By an act of Congress, approved March 4, 1913, all birds which do not remain within the borders of a single state are placed under the protection of the United States Department of Agriculture. The regulations permitted by the law were proclaimed by the President on October 1, 1913; they established a breeding zone and a wintering zone, with separate closed seasons for each.

Game Preserves and Reservations. In medieval Europe it was the rule for princes to maintain private breeding and hunting grounds. This custom was adopted by the nobles and is still in force in Austria-Hungary, Germany, England and Scotland, where immense properties known as hunting estates have been maintained by private land owners for the preservation of game. During the World War, however, many English preserves were abandoned because of the need of land for agriculture.

In the United States the preservation of game has been assumed as a function of the national, state and local governments, and the greatest efforts are being made to prevent the extinction of peculiar species, such as the bison, the caribou, the eagle and other interesting birds and beasts. To further this end, tracts of land have been set aside where such animals can live the life their instincts demand, free from the depredations of hunters or the annoying presence of settlers. The first and largest of such reservations in the United States is the Yellowstone National Park, having an area of over three thousand square miles. At the present time there are many such sequestered tracts, situated in states and territories west of the Mississippi River, embracing a total area of more than ten thousand square miles. Canada has also made generous provisions for the same purpose, the largest of all such reserves being the Rocky Mountain Park, Alberta, with an area of 4,500 square miles.

Besides these government reservations, there are large private parks ranging from 10,000 to 80,000 acres each. Probably the finest game preserve in America is that of the late George W. Vanderbilt at Biltmore, North Carolina. The game preserves in Canada are of enormous extent, though comparatively few in number. That of the Roberval Club, in the Laurentian Mountains, contains over 500 square miles.

GAMES AND PLAYS. The educational world is beginning to recognize the importance of play in the development of a child's character, and many public school systems make provision for games and plays in their course of study. Large cities are not only establishing playgrounds at public expense, but are also providing attendants who can teach the children interesting and healthful games. The suggestions here given are for the purpose of assisting teachers and parents who wish to teach the children under their charge to play in the right way.

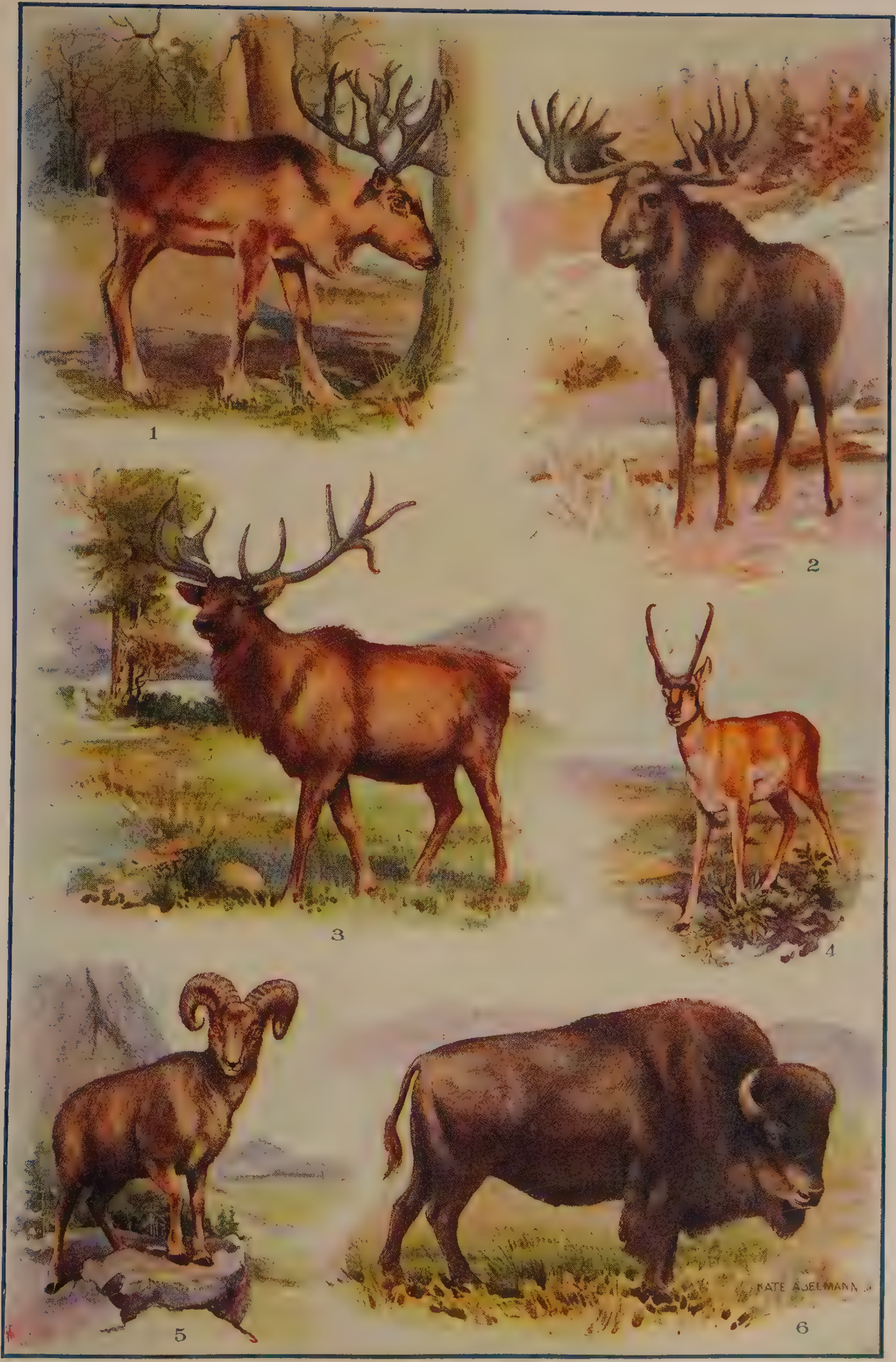
Value in Play. "Play is not trival; it is highly serious and with deep meaning," says Froebel. Play is one of the ways in which the child expresses himself. Games furnish one of the means of securing at least part of the development stated in the educational ideal—"a healthy mind in a healthy body." Games aid in the cultivation of social and of competitive activity; they afford an opportunity for ethical training.

The play time furnishes an opportunity of so refreshing the body and mind, stiffened or fatigued from close application to work, that the work itself will be more advantageously pursued, and the time used in exercise more than made up because of renewed interest and attention. Because little children become easily fatigued, frequent brief play periods should be provided for, rather than one long one.

Aims. This work in physical training should always be:

(1) Hygienic, adding to the health of the child through its good effects on circulation, respiration, etc.

(2) Corrective, tending to correct the de-



GAME ANIMALS OF NORTH AMERICA

1—Caribou. 2—Moose. 3—Wapiti. 4—Pronghorn. 5—Bighorn Sheep. 6—Bison (no longer at large).

fects in posture and movement caused by stooping over desks, etc.

(3) Educative, training the brain, nerves, and muscles to alert, controlled action: the harmonious working of body and mind.

(4) Recreative, furnishing relaxation, fun, joy, all of which increase the value of the work for the pupil.

Now every game cannot have all these four values. The game, the aim of which is educative, as ring toss, which requires precision of movement and quick response of the body to the mind, should be played often, but not to the exclusion of others whose main aim is, let us say, hygienic, as racing, which gives a healthy stimulus to the circulation and respiration. Vary your games.

Some Simple, Practical Suggestions. Do not waste the short play time in making elaborate plans about what is to be played; get right to business and keep things moving.

During the game, throw open the windows so that the air may be completely changed.

Let the teacher enter into the spirit of the play, making it a period, to an extent, of recreation to herself. She needs it.

Encourage the children to get into the habit of taking deep, full breaths to "wash out" the lungs. Tell them to take three such breaths every time they step out of a door into the air.

The best method of teaching a game is to make a full explanation of it before the pupils take their places to play. Never try to teach and play a game at the same time.

As a rule let the children choose the games. Encourage "team" work, trying with all their might to win for their side.

Insist on holding to the simple rules of the game—to the honest winning or losing of a game.

Games for Young Children

In the Schoolroom or the Home

I Saw. A child in each row tells of some action he has seen, as a duck flying, a soldier marching, or a train speeding, at the same time illustrating it. Each row in turn follows its leader around the room, imitating the action shown.

Express Train: Children are chosen for engine, headlight, bell, wheels, conductor, passengers, etc., and run in a row up and down the aisles, executing the action appropriate to each part. "Train is stopping!" calls the teacher. It comes to a standstill, children take their seats, and another train is "made up."

Squirrel Game. The children blind their eyes with heads upon their desks, and one hand open, in the hope of getting a nut which one child, the "squirrel," may drop into it. The child who receives the nut runs on tiptoe after the squirrel and tries to catch him before he reaches his seat. If he does not, then he is "squirrel."

Hole in the Ice. The "hole" or "crack" in the ice is represented by two chalk lines on the floor. One row of children at a time runs or jumps, in turn, trying to jump over the "hole." If any one touches the floor between the lines, instead of going home to his seat he must first come to the front of the room, while the other rows are jumping, and dry his feet by running on tip toe "on place." The width of the "crack" may be gradually increased. This game is good for circulation and respiration.

Follow the Leader. A competent child leads the class around the room, up and down the aisles, skipping, then waving, stepping high like a horse, clapping, etc., changing quickly from one to another. The other children imitate. This and the following are excellent for brief recreative exercise.

Review Roundel. (This may be sung to the tune "Yankee Doodle.")

"There you stand before us all
To teach us what to do, sir!
Now show a motion you recall
And we will follow you, sir!"

The pupils should stand at their desks or in a circle. The pupil chosen for "teacher" stands in front. The pupils march forward on lines 1 and 3, and backward to place on lines 2 and 4, singing as they step. At the close of the song, the "teacher" shows a favorite exercise, as sawing wood, touching the floor with the finger tips with knees sprung back, etc. The rest of the class imitate it. "Teacher" may mark the rhythm by singing "la" to "Yankee Doodle" tune, as the pupils take the exercise. This game gives all a little exercise at once.

Bean Bag Games. The following games can be played with bean bags about 5 inches by 5 inches made by the children (a set of these should be in every schoolroom for games), or with a large, light rubber ball. Some games can be played out of doors.

The teacher may open the game as follows: As many pupils as possible may take places on a chalk circle drawn on the floor in the front of the room, or where there is a vacant space.

The pupil who is "it" or "teacher" tosses the bag to any pupil in the circle, who becomes "teacher" if he catches the bag, or must take his seat if he does not. The pupils for whom there was not room at first, may fill vacant spaces. The game may be varied by the "teacher" tossing the bag in the air and calling the name of the child, who becomes teacher if he jumps forward and catches it, or takes his seat if he does not. The latter variation of the game should be played very quickly.

Cat-Stitch. Number the rows or aisles of children, 1, 2, 3, 4, etc. The pupils should stand, each even row facing the nearest odd row. The first pupil in the even row tosses the bag to the second pupil in the odd file, the bag continuing in a zigzag course to the last pupil, who tosses it directly across, so that after returning in a zigzag course, the first pupil in the odd row, will have the bag. Count may be kept to see which double row finishes, without dropping the bag, first. Allow laughter, but insist on attention.

Touch Ball. The ball or bag is passed rapidly from one to another of those forming the circle high or low, across the circle, or in any direction, stated by the teacher. A player, or "it," in the center, tries to touch the ball or bag, and changes places, when successful, with the one who had it when it was touched.

Out of Doors

Play out of doors when possible. Some of the following games may be played indoors, if space permits, in stormy weather:

Cat and Mouse. The players form a circle, grasping each other's hands and standing about an arm's length apart. The cat stands outside the circle; the mouse to be caught stands inside. The pupils forming the circle may favor one or the other by raising arms to allow passing in and out of the circle, or may lower arms to prevent it. As soon as the mouse is caught, other players are chosen.

Hawk and Hen. About ten or twelve children stand, one behind another, with their hands on the shoulders of the player in front, and represent hens. Another player the hawk, tries to catch the last hen in the line, and the first hen tries to prevent this by getting in front of him, and by raising arms, etc., while the rest try to keep out of the way of the hawk. As soon as a hen is caught, she is out of the game. Choose an alert mother hen to head the line.

Moon and Morning Stars. This game is played when the sun is shining. One of the players is the moon and takes her place in the shadow of the schoolhouse, a tree, etc. She must not go into the sunshine. The other players, the morning stars, dance from the sunshine into the shadow near the moon, calling:

"O the Moon and the Morning Stars!
O the Moon and the Morning Stars!
Who will step—Oh,
Within the shadow?"

The moon tries to tag the stars, and they may either be kept with her or change places with her, as the players decide.

Dare Base. A line is drawn midway between the goals. A catcher stands at each end of this line. The other players run back and forth between the goals; they may not be tagged when in the goals or on the base line, but they may not pass back to the goal from which they started until they have gained the opposite goal. Those who are caught are put out of the game, or they may be made catchers.

Black Man. One is counted out as Black Man. The rest come round, crying, "Who is afraid of the Black Man?" Suddenly the Black Man begins to chase. When one is caught, he is Black Man, or else he may be the Black Man's Helper. The game closes when all are caught. Bounds must be set beyond which no one may run.

Frog in the Middle. Any number may play this. One player is chosen for "frog" and sits in the center with his feet crossed. The other players stand in a circle around the frog, repeating, "Frog in the middle can't catch me!" They dance forward toward the frog and back, taking risks in going close. He must keep his position while trying to tag his tantalizers. The one tagged is frog.

Other Games. Among other games suggested for young children are the following: Mulberry Bush, Farmer in the Dell, Jacob and Rachel, Oats, Peas, Beans, Drop the Handkerchief, London Bridge, Hopping, Three-Legged and Backward Races, Stoop Tag, Wood Tag, Pussy Wants a Corner, Bean Bag Throw, Itisket-Itasket, Shadow Tag, Follow Chase. Most of these one child or another will recognize by name and will gladly lead. See, also, Kindergarten.

Games for Older Children

In the Schoolroom or the Home

Many of the games suggested for young children remain favorites and may be continued as the children grow older. As children grow older they enjoy the "team" element in games and are more anxious for their side to win than are the young children, who love more the mere activity of the game. Races, especially relay races of all sorts, appeal, therefore, to older children.

Bean Bag Race. Bean bags, books, erasers, or wands are held above the heads by pupils seated in the front seats. All the children sit erect with arms raised overhead. At command the bags are passed backwards above heads by pupils until the last pupils are reached. These pass them forward in the same manner. The pupil in front first receiving the bag rises to show which row has won. Allow the enthusiasm free expression in this most valuable game.

First In, First Out. A group of three erasers, or bean bags, etc., is placed in a chalk-marked square on the floor in front of alternate rows. The players, beginning with the pupils in the front seats of these alternate rows, take the objects one at a time from the square and place them in a similar square at the back, running down one aisle and returning by the other. When all are gathered, they are returned in the same manner, and the pupils in the second seats, without pause, continue the game. The row whose pupils finish first indicate it by clapping. The game is full of fun and excitement and a great outlet for the repressed energy of the child from ten to fourteen.

The same rules apply to the game of running to touch front and back wall in succession, and then taking the seat which can be played when time is very limited and relaxation for all is desired.

Running Relay. The room may choose sides to last for a week. These sides may stand in close rows in the two center aisles, leaving aisles for runners at each side. Each leader has one bean bag. At the teacher's word "Go," the bag is passed rapidly down the line. The last pupil runs to the head of the aisle with it and the passing continues, the line gradually moving down as the children come to the head. This lasts until the first player is in his position again as leader. The side whose leader is first in place indicates winning by clapping.

Tossing Tally. Let pupils, one from each row in turn, stand at a given distance from a slanted board, two by three feet, with an opening eight inches square in the center, and throw bean bags. Bags passing through the center score ten points; those landing on the top of the board score five points, and those landing on the floor diminish the score by five points. Bags displaced count for the rows by which they are displaced. The score should be 100.

Out of Doors

Three Deep. The players form a double circle, one within the other. The distance between the players must be two steps. One player stands directly behind another. There are two "its," one trying to tag the other as he runs around the outer circle. Just as he is about to be tagged, the runner quickly moves to the inside in front of a pair of players (making "three deep"), and then the last, or outside player, must run. If the tagger succeeds in touching the runner before he jumps inside, they reverse the running, the one who has tagged trying to get in front of a pair at once. The children should never run across the circle or between circles to reach inside. The game is a particular favorite with older children.

Fire on the Mountains. Places are marked in a circle by sticks or stones, with considerable space between, providing for two less spaces than there are players. One of the odd players is a leader, and sits or stands in the center; the remainder, or "circle men," take the places marked. The other odd man stands anywhere between the bases or marked places. The object of the game is for the "circle men" to change places on a signal from the leader, each player trying to avoid being the odd man by losing a place. The longer the distance between the bases, the better the sport. The running must be done in a circle outside of the bases and no cross cuts through the circle are allowed. The player in the center calls:

"Fire on the mountain, run, boys, run!
You with the red coat, you with the gun;
Fire on the mountain, run, boys, run!
Base!"

Then the changes must be made, the center man and the other odd man trying to get a base. Those left out are the "its" as the game continues. Forfeits may be used in this game.

Last Couple Out. This game requires an odd number of players. One is chosen for catcher, who stands with his back to the rest, not less than ten feet in front of the rest of the players. The rest of the players stand in couples in a long line behind him, facing in the same direction that he does. The catcher calls, "Last couple out!" Then the last couple in the line runs toward the front, the right-hand one on the right side of the double line, and the left-hand one on the left side, and try to join hands in front of the catcher. The catcher must not chase them before they are in line with him, and must not turn his head to see them as they come. They should try to confuse him by circling far out beyond him on either side, or by one keeping close and the other circling out, etc. If the catcher succeeds in catching one of the players before that player can clasp hands with his partner, these two, catcher and caught, form a couple at the head of the line, which moves back a step. If neither is caught they are free, or out of the game.

Trade Game. A few players step aside and decide on some trade to represent. They advance to the others, saying: "Here we come!" The others respond, "Where from?" "New York," they reply. "What's your trade?" The few then show in pantomine some trade, either all taking the same action, or various actions used in the occupation chosen. The first one to guess the trade chases the players, trying to tag those desired for the next trade game, which the guesser promptly gathers a few players to decide upon. This is one of the most valuable of the "guess-action" games, which the teacher can vary to suit the needs of the school.

Other Games. Among other games suggested for older children are the following: Potato Relay Race, Black Tom, Hound and Rabbit, Prisoner's Base, Indian Club Race, Vaulting Relay Fox and Geese, Tug of War, Poison Snake, and Medicine Ball. Most of these the children will recognize by name. Discussion of the rules in school helps greatly when the games are played.

Quiet Games

The following quiet games, with fewer physical values, are yet of great value for recreation and for mental training:

Magic Music. An object is hidden after one child has been sent from the room. Upon his return, those in the room help him to find it by humming a familiar tune or by clapping, softly at first, but loudly as he nears the hidden object. This is good for ear training and motor control.

Beast, Bird or Fish. One child comes to the front of the class and says: "Beast, bird or fish!—Bird! Martha!" Before the child in front counts to ten, Martha, or whoever is chosen, must call out the name of a bird or else come to the front. Beast and fish are called in the same way.

Horns Up. Hands should be placed with thumbs up, as in "Simon Says Thumbs Up." The leader calls: "All horns up!" "Dog's horn up!" or "Cow's horn up!" As he speaks, he lifts his own thumb up. When he names an animal that really has horns, all players lift their thumbs; when he names one that has no horns, any player that points his thumb up is out of the game.

My Thought.. Teacher: I'm thinking of a word that rhymes with "pat."

Pupil: Is it what you wipe your feet on?
Teacher: No, it isn't "mat."
Pupil: Is it an animal that catches mice?
Teacher: No, it isn't "cat."
Pupil: Do you play ball with it?
Teacher: Yes, it is a "bat."

The same guessing idea may be carried out by sending out one child while the rest choose an object in the room, and then giving the child the right to ask ten questions of the pupils, in his attempt to guess the object. His first questions should determine whether it is animal, vegetable or mineral.

Guess Again. The teacher has sets of cards in Geography, History, etc., on which she has written the principal seas, cities, productions or the like, already learned by the children. She picks up one card at random on which may be written Pacific Ocean, and calls, "An ocean! P." Before the teacher can count ten, the child she calls upon must name an ocean beginning with the letter P. There are many variations of this review game which will suggest themselves to the teacher.

Acting Charades. Children heartily enjoy "making up" plays, as in acting charades. Sides are chosen and each side in turn selects some word to be guessed by the other side. For instance, if Washington is chosen, it may be divided into "washing" and "ton." The act of washington may be represented and then the act of weighing, after the explanation has been made that it is a proper noun of three syllables to be played in two acts. This game, too, is capable of great range, and cultivates great ingenuity on the part of the children.

GANGES, *gan′jeez,* an important commercial river of India, one of the largest in Asia. To devout Hindus it is the sacred Ganges, for they believe that its waters possess healing properties, and that one who dies on its banks and drinks of its waters before death is assured of entrance into Paradise. Temples and shrines are numerous along its banks, and thousands of pilgrims congregate at certain cities to bathe in the stream and obtain some of the holy water for use in religious ceremonies.

The river rises in the Himalaya Mountains nearly two miles above sea level, and falls by several channels into the Bay of Bengal. Its total length is 1,557 miles. The Ganges delta, which is probably the largest in the world, commences about 200 miles from the sea. The valley is one of the most fertile in the world, and produces almost all kinds of Indian vegetation, including rice, fruit, cotton, indigo, opium, sugar and grains. As a highway for commerce the Ganges is a very important stream. Some of the principal cities on it are Calcutta, Murshedabad, Bahar, Patna, Benares, Allahabad and Cawnpore.

GANGES CANALS, a system of canals in India extending parallel to the Ganges River. There are two main divisions, the Upper and the Lower canals, which extend from Hardwar to Allahabad. These canals are used for navigation, and with a number of branches they serve also as great reservoirs for irrigation. The country which they help to make productive covers nearly 2,000,000 acres. The system cost $25,000,000 to construct.

GAN′GLION, the enlargement of a nerve, containing cells and fluids and acting as a center for communication with other sets of nerves or for strengthening nervous impulse. See NERVOUS SYSTEM.

GAN′GRENE, the death of some part of a living body, wherein the tissues are in a state of mortification. If a vital part is so affected, death will ensue, but a local affection may be stopped by amputation or, in milder cases, by careful hygienic and medical treatment. Because of marked advance in surgery and aseptic methods, gangrene is less common than formerly. See SURGERY.

GAN′NET, a large sea bird, about three feet in length, with a wing expansion of six feet. It has a dirty white plumage and pale yellow eyes, surrounded by a naked blue skin. Its straight bill is about six inches long and is furnished, underneath, with a kind of pouch. The gannet is found from the Arctic Sea to the Gulf of Mexico and breeds in large colonies near the coast of Labrador. The birds hunt from high in the air, and when they see a fish they drop straight upon it with wonderful accuracy. When on land the bird is absurdly fearless, and the mother when approached will remain on her nest, merely pecking if a hand is put out toward her.

GANYMEDE, *gan′i meed,* in Greek mythology, a Trojan youth so beautiful that even the gods marveled at him. Jupiter sent his eagle to steal the boy from Mount Ida and carry him to Olympus, where he succeeded Hebe as cupbearer to the gods.

GAPES, *gaypse,* a disease of fowls, arising from the presence in the windpipe of small, parasitic worms, which cause the bird continually to open its beak and to cough. The parasites may be dislodged with a feather dipped in turpentine or by mixing a little epsom salts with the food. Another remedy consists in making the fowls breathe the dust of air-slaked lime. This causes a spell of violent coughing and dislodgment of the worms. After the fowls have recovered, the coops and all their contents should be disinfected.

GAR, the name of two species of fish, which are similar in structure and appearance. The marine gar is round and slender, from three to five feet long, and has a stout bill, formed by a prolongation of the jaws. These fish are widely distributed in the warm ocean waters and live upon smaller fish. The fresh-water gar has a long, nearly cylindrical body, covered with bony scales; the head has a long bill with a series of sharp teeth. This fish is common in lakes and rivers in the eastern part of the United States.

GARAGE, *gahr azh'.* The advent of the automobile gave rise to many accessories. One of the most conspicuous is the *garage,* which is a place for storing and caring for automobiles. Connected with public garages are mechanical departments, in charge of men competent to make repairs. The word was borrowed from the French, without change in form, and means to *keep under cover.*

GARBAGE, *gahr'baj,* the waste matter, mostly of animal or vegetable origin, that comes principally from kitchens. This waste quickly decays if exposed to the air and becomes a source of disease. If it is thrown upon the ground, the water supply and the air in that vicinity are contaminated. In the country and in small towns a great deal of garbage is consumed by domestic animals and so rendered harmless, though if the troughs in which it is held are not frequently cleaned, the animals themselves may suffer.

In small communities methodical garbage disposal is considered possible only in one way—by burning—but in large cities a revolution has been wrought. What was once an expense to a city has now become a source of revenue. Until recently $50,000 per year was paid by the city of New York to a contractor for the removal of all the city's garbage, which the householder places in cans provided. He offered to do the work for that really nominal sum because he admitted that certain parts of the collections could be turned to profit. A few years later it was discovered that his profits were very large; scarcely a bit of the garbage remained to be burned after it had been subjected to processes which extracted economically valuable products. The same contractor then offered to pay the city $150,000 per year for the privilege of removing the city's garbage.

Value of Garbage. In the family garbage can are found the scraps of all foods which enter the kitchen and are not eaten, also tin cans, paper, rubber and the like. Modern conservation methods find a use for everything. The paper can be sent back to the paper mill, to become again new paper; tin cans are salvaged for the tin they contain, rubber can be used again in rubber manufacture. After all organic matter has been removed the vegetable matter remaining is boiled for several hours, then squeezed under very heavy pressure to eject all possible moisture. It is then made thoroughly dry, after which it is ground fine. This resulting powdery material is called *tankage.*

Tankage contains ammonia, potash and bone phosphate, and it is made into fertilizer of low grade. The liquid removed from the garbage by pressure after boiling is largely grease; from it is made soap and glycerine, and it enters also into the manufacture of dynamite and nitroglycerine. After all these products have been obtained there remains a residue which would appear to have no value, but it is sold for fuel in manufacturing plants.

GARCIA Y INIGUEZ, *gahr se'a e e ne' ges,* CALIXTO (1836–1898), a Cuban patriot and soldier, born at Holguin, Santiago Province. He began the practice of law, but in 1868 became a leader in the Cuban insurrection and later succeeded Maximo Gomez as commander in chief of the Cuban forces. At one time, being surrounded by a greatly superior force, he attempted to commit suicide rather than be captured, but was taken to Spain and imprisoned. Afterward he joined in another Cuban rebellion, was again captured and was taken to Spain, where he was held for fifteen years. He escaped in 1895 and came to the United States, where he engaged in filibustering. Later he succeeded in reaching Cuba and won important victories as one of the chiefs of the Cuban forces. After the occupation of Cuba by the Americans, he was appointed one of the commissioners to discuss Cuban affairs with the United States government at Washington, and died during that conference.

When war first broke out between Spain and America, Garcia was in the wilds of Cuba. President McKinley sent a young man named Rowan to the island, with orders to find the insurgent leader and deliver a message to him. This most difficult task was accomplished so quickly and effectively that it inspired Elbert Hubbard to write his stirring *A Message to Garcia.*

GARDA, *gahr′dah,* the largest lake in Italy, nestled amid the beauties of Alpine scenery. The mountains tower on three sides of it, and on their slopes are perfect highways. During the World War Italian and Teutonic armies fought on two sides of Garda. The lake is over thirty miles long, and it varies from three to eleven miles in width.

GARDEN, Mary (1877–   ), a grand-opera star, born in Edinburgh, Scotland. When very young she moved with her family to America, where her musical education began with study of the violin, at the age of six. In course of time she studied piano, and at the age of nineteen, with the help of friends, went to Paris, where she spent four years cultivating her voice. Her début came quite unexpectedly in 1900, when, on a certain evening the leading soprano of the Opéra Comique in Paris became suddenly ill at the end of the second act of Charpentier's *Louise;* Miss Garden sang the third act and continued the part for a hundred nights. Subsequently she sang in London, Brussels and other European centers. She made her American début in 1907. Garden appears to best advantage in parts for which she is temperamentally equipped, notably *Mélisande, Thais, Sappho, Louise* and *Salome.* She possesses a rare gift of impersonation which quite offsets for purposes of music drama certain vocal inadequacies. Miss Garden became manager of the Chicago Opera Company in 1920.

GARDENIA, *gahr de′ni a,* a shrub of the madder family, bearing white or yellow flowers of attractive appearance and delightful fragrance. A double-flowered variety grows out of doors in the southern part of the United States, and it is a popular hothouse plant in the North. The name was bestowed on the gardenia group by Linnaeus, who selected it to honor Dr. Alexander Garden, of Charleston, South Carolina. An East India species yields a beautiful yellow resin, and the hard wood of another species is used for agricultural implements in South Africa.

GARDENING, the art of cultivating plots of ground, for the purpose of raising ornamental flowers, vegetables and fruits. This art is as old as civilization itself. According to Bible lore, Adam and Eve had their first home in a garden, and the delight of the ancient Egyptians and Babylonians in their gardens is disclosed by their records. Gardening never lost favor through the ages that followed, and to-day it is being emphasized more than ever, both for practical reasons and from an esthetic and recreational standpoint. Flower gardens train the artistic sense and educate one in matters of line and color, besides teaching the gardener many facts of botany. These gardens, no less than those devoted to vegetables, may be a valuable source of profit. There is no question, too, as to the healthfulness of gardening. It takes one out of doors and provides a wholesome form of exercise. There are many periodicals and books devoted to all phases of home gardening, and these should be of great value to the beginner.

In America school gardens have been encouraged by the Agricultural Department for a number of years, but notwithstanding the popularity of these, the home garden came into unprecedented favor after the country entered the World War. The government asked all who had available space to devote it to the raising of food products, and so widespread was the response that the war gardens of 1917 and 1918 yielded crops worth millions of dollars.

School Gardens. While the school garden in the United States is of comparatively recent date, it has been in existence in Europe for a long time, and European countries now have over one hundred thousand school gardens. In Russia and several other countries, no school can receive aid from state funds unless it has a garden. A school garden is valuable for the following reasons:

(1) It enables the pupils to gain a practical knowledge of farm crops.
(2) It assists in giving the pupils practical training.
(3) It affords the best opportunity for nature study.
(4) It affords opportunity to train pupils to habits of industry and to develop the feeling of ownership and responsibility.
(5) It affords one of the best means of assisting pupils to gain an all-round development.
(6) It helps to keep the boys and girls on the farm.

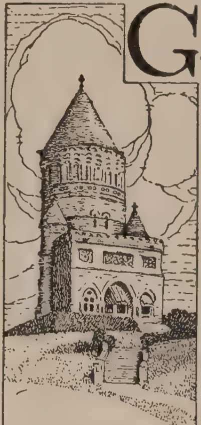
In making a school garden the following suggestions will be found helpful:

(1) Secure the consent and coöperation of the school directors.
(2) Have your plans well matured before beginning work on the ground.
(3) So plan the work that it will be done out of school hours.
(4) Study and work with enthusiasm, make the garden succeed and it will be popular.

GARDEN OF THE GODS, a beautiful region about five miles northwest of Colorado Springs, noted for the curious and grotesque shapes into which the colored sandstone rocks have been worn by the wind and rain of countless ages. The Garden has an area of 500 acres. Two huge masses of bright red sandstone, 330 feet high and separated just enough to allow a roadway between them, form the gateway of the Garden. Other famous rocks, whose names indicate their shape, are the Cathedral Spires, the Balanced Rock and the Seal and the Bear.

GARDINER, Samuel Rawson (1829–1902), an English historian, born at Ropley, Hants, England, and educated at Winchester and Christ Church, Oxford. He also studied at Edinburgh and Göttingen and was for many years professor of modern history at King's College, London, and later at Oxford. He was appointed to succeed Froude as regius professor of modern history at Oxford, but declined. Gardiner was the author of numerous historical works of the highest value, of which the most important are *The History of England from the Accession of James I to the Outbreak of the Great Civil War*, *The History of the Great Civil War*, and *The History of the Commonwealth and Protectorate.* The last was not quite completed at his death. Another important work was *The First Two Stuarts and the Puritan Revolution*, which was a condensed but exceedingly valuable story of the same period. He also wrote a *Students' History of England* and *An Introduction to the Study of English History.*

GARFIELD, Harry Augustus (1863–), a distinguished son of President James A. Garfield, was born at Hiram, Ohio. After his graduation at Williams College in 1885 he taught school for a year and then engaged in law practice at Cleveland. From 1903 to 1908 he was professor of politics at Princeton University, and in the latter year was chosen president of Williams College. This position he held until 1917, when he resigned to accept the position of fuel administrator for the United States. In this post it became his duty to conserve the supply of fuel so that needed war industries would not suffer. Early in 1918, as a result of a coal shortage that threatened to interfere with the conduct of the war, Garfield ordered a five-day shut down of industries over a wide area in the country.


Tomb at Cleveland

GARFIELD, James Abram (1831–1881), an American soldier and statesman, twentieth President of the United States. His election to the highest office of the nation was the climax of a career in which he had won an honorable reputation as a teacher, military leader and Congressman, and he assumed his new duties with high hopes. Barely four months from the day of his inauguration he was shot by a disappointed office seeker, and died eleven weeks later, the second President to suffer a martyr's fate. It is of interest to recall that sixteen years before, at the time of Lincoln's assassination, he had calmed an angry mob in Wall Street by a few eloquent words, concluding with—"Fellow citizens! God reigns, and the government at Washington still lives."

Garfield was born in Orange, Ohio, on November 19, 1831. His father died soon after the boy's birth, leaving his wife, unaided, to bring up her four small children. At the age of ten, young Garfield added to his mother's income by work on neighboring farms and by driving horses on the Ohio Canal. In winter he made steady progress

Outline on Garfield

I. James Abram Garfield
  (1) Birth and parentage
  (2) Work during boyhood
  (3) Attended district school
  (4) Seminary and college
  (5) Teacher. Study of law
II. Military Career
  (1) Battle of Middle Creek
  (2) Battle of Chickamauga
  (3) Promotion to be major-general
III. Career in Congress
  (1) Work on committees
  (2) House leader of Republicans
  (3) Election to Senate
  (4) Made Presidential nominee
IV. Administration
  (1) Factions in Republican party
  (2) Controversy with Conkling and Platt
  (3) Death and burial

Questions on Garfield

Why did Garfield have to work during his boyhood?

How old was he when he served on the "towpath"?

To what Church did Garfield belong?

How did he obtain a college education?

Of what institution was he a graduate?

What position did he afterwards hold in his *alma mater*?

How did Garfield distinguish himself as a warrior?

Upon what questions was he authority while in Congress?

What new departure did he make as a Presidential nominee?

Who was his opponent in the election?

What was the result of his dispute with Senator Conkling?

Quote Garfield's memorable words referring to Lincoln's assassination.

What was his record throughout the Civil War?

For how many years was he a college president?

How many Presidents of the United States have been murdered while incumbents of that high office?

in the district school, and in 1849 he entered Geauga Seminary, at Chester, Ohio. He next went to the college at Hiram, Ohio, supporting himself meanwhile by tutoring, and finally was graduated at Williams College, Mass., in 1856. Returning to the college at Hiram, he became its president in 1857, at the same time studying law. He also preached occasionally, as he was a member of the Disciples of Christ Church, which gave lay members that privilege in the days when Garfield was a young man.

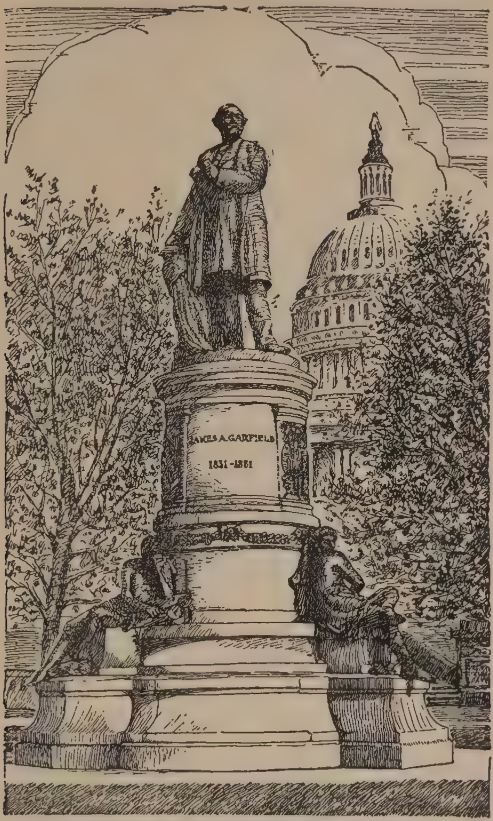
JAMES A. GARFIELD

Garfield was elected to the state senate in 1859, and on the outbreak of the Civil War he received the command of a regiment of Ohio volunteers. In December, 1861, he was given a brigade, with orders to drive the Confederates out of Eastern Kentucky, and he won the battle of Middle Creek, January 10, 1862, from which his commission as brigadier-general was dated. He was promoted to be major-general for gallantry at Chickamauga, September 19, 1863, but resigned his command to enter Congress, at the age of thirty-two. He sat in Congress, rendering valuable assistance in military and financial questions, until 1880, and he was a leader of the Republican party in the House.

In January, 1880, Garfield was elected United States Senator, and in June of the same year he was named Presidential candidate by the Republican convention at Chicago. Garfield's nomination came as a surprise to his party and was simply the result of a compromise between the supporters of Grant and Blaine. He proved, nevertheless, a strong candidate, and regardless of precedent delivered speeches in his own behalf, defeating General Hancock by a narrow majority of the popular vote, but by 215 to 155 electoral votes.

Garfield was unable to carry out his plans of harmonizing the two factions of the Republican party. The so-called "Stalwart" faction, headed by Senators Conkling and

Platt of New York, opposed his appointment of W. H. Robertson as collector of the port of New York, and a bitter controversy ensued, which resulted in the resignation of the two Senators. Their legislature refused to reëlect them, and the Senate confirmed Garfield's appointment of Robertson.



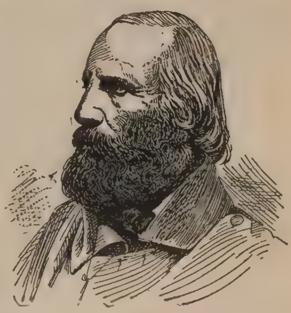
MONUMENT AT WASHINGTON

The President was therefore the victor in this first battle of the factions, and it was with a light heart that he set off, on the morning of July 2, 1881, for his old college, to attend a class reunion. While he was walking through the railway station at Washington he was shot down by a disappointed office seeker, Charles Guiteau. For weeks he lingered between life and death, but in September he died near Long Branch, N. J., where he had been taken in the belief that the change of air might do him good. He was buried in Cleveland, Ohio, where a beautiful mausoleum has been erected. A subscription was immediately started for the family, and in a short time over $350,000 had been subscribed. When Guiteau was brought to trial his advocates attempted to show that he was insane, but convincing proof was lacking, and he was hanged in June, 1882. (See illustration, in article Arthur, Chester A.)

GARGLE, *gahr′g'l*, a wash for the throat. In using a gargle the head should be thrown well back, to keep the liquid in contact with the throat; then by expulsion of the air from the lungs through the liquid it is churned about and the throat is thoroughly washed. Care should be taken not to swallow the gargle, which sometimes contains drugs too powerful for the stomach. Listerine, glycerine and water, in equal parts, is an effective gargle for sore throat.

GARGOYLE, *gahr′goil*, a stone water spout usually of grotesque design jutting from the roof gutter of a building. While elaborate spouts representing animal heads were in use in ancient times, the typical gargoyle, a figure of fantastic ugliness, was evolved along with Gothic architecture and used extensively on medieval and Renaissance cathedrals. It is by some believed to have originated with the superstition that hideous figures in conspicuous places on the building would frighten evil spirits away from the sacred precincts. Particularly famous are the gargoyles on the Cathedral of Notre Dame, Paris. See Notre Dame.

GARIBALDI, *gah re bahl′dε*, Giuseppe (1807–1882), an Italian patriot and hero, honored in his country as Washington is in America. He received little education, and for a number of years was a sailor on various trading vessels. In 1834 he became a member of the Young Italy party, was condemned to death for his share in the schemes of Mazzini, escaped to Marseilles, took service in the fleet of Tunis, and finally went to South America. In the service of the republic of Rio Grande against the Brazilians he became known as a brilliant leader, and with his famous Italian legion subsequently gave the Montevidians effective aid against Buenos Aires.



GARIBALDI

In 1848 he returned to Italy, raised a band of volunteers and harassed the Austrians until the reëstablishment of Austrian supremacy in Lombardy. He sailed to the United States and was for some years in command of a merchant vessel. He then purchased a part of the small island of Caprera, off the north coast of Sardinia, and made this his home for the rest of his life. Latterly the subscriptions of his admirers enabled him to become owner of the whole island.

In the war of 1859, in which Sardinia recovered Lombardy, Garibaldi and his Chasseurs of the Alps did splendid service; and on the revolt of the Sicilians in 1860 he crossed to the island and wrested it from the king of Naples, after a fierce struggle. He then recrossed to the mainland and occupied Naples, where he was proclaimed dictator of the Two Sicilies. It was then feared that Garibaldi might prove untrue to his motto, "Italy and Victor Emmanuel" but he readily acquiesced in the annexation of the Two Sicilies to Italy and, declining all honors, retired to his island farm. In 1870 he gave his services to the French government against the Germans and rendered valuable assistance in the southeast. At the end of the war he was elected a member of the French assembly, but resigned his seat and returned to Caprera. In January, 1875, Garibaldi took his seat in the Italian Parliament, but did not distinguish himself politically.

GARLAND, Hamlin (1860–), an American novelist and poet. Among his novels, with their realistic pictures of western life, are *The Rose of Dutcher's Cooly, The Eagle's Heart* and *Captain of the Gray Horse Troop,* while of his other works may be mentioned a sympathetic biography of Ulysses Grant; a volume of criticism called *Crumbling Idols,* and *Prairie Songs,* a volume of verse, were among his earlier works. As a short-story writer Garland takes rank among the best, and *Main Traveled Roads* (1898) is a volume in his happiest narrative style. Later books from his pen include *The Long Trail; The Tyranny of the Dark; The Shadow World; Other Main-Traveled Roads,* and *A Son of the Middle Border.*

GAR'LIC, a hardy plant related to the onion, whose edible part has a strong, penetrating odor and a sharp taste. The Italians and Spanish are fond of garlic, and they season many foods with it, but to most North Americans it is very disagreeable. The plant grows about two feet high and bears grasslike leaves, resembling those of the onion, except that they are not tubelike. Garlic root, the part eaten, is a compound bulb, consisting of several smaller bulbs, or *cloves.* The plant is usually propagated by the cloves, and is easily cultivated.

GAR'NET, the birthstone for January, is a beautiful mineral classed as one of the semi-precious stones. It occurs in twelve-sided crystals, usually of a dark red or cinnamon color, but sometimes it is white, green, brown or black. Because of their composition, garnets are classified into three groups: Those containing iron are known as *iron garnets;* those containing aluminum are known as *aluminum garnets,* and those containing calcium are known as *calcium,* or *chromium, garnets.* The aluminum garnets are usually the best; and the best of these when polished form beautiful gems. Garnets have been made artificially.

Ordinary garnets are of little value; these are ground and used in polishing other stones or are employed instead of sand in making sand paper. New York state produces about 4,000 tons a year for these purposes. The garnets of gem quality are found principally in Bohemia, Ceylon and South Africa. See Precious Stones; Birthstones.

GAR'NISHMENT, the legal process by which property or assets of a defendant in the hands of a third person are seized and used in satisfying a plaintiff's claim. This is closely regulated by statute. It is most commonly used to secure the payment of a debt by seizing the wages of a debtor, although in some states persons in certain classes of labor are not subject to suit where their wages are involved.

GARONNE *ga rohn',* **RIVER,** an important river of France, forming, with its thirty-two tributaries, a system of navigable waterways of greater extent than that of any other river in the country. It rises on the Spanish side of the Pyrenees, entering France twenty-six miles from its source. From that point it flows northeasterly to Toulouse, then turns to the northwest and falls into the Bay of Biscay at Point de Grave. The estuary of the river, formed by its union with the Dordogne, is called the Gironde. Ocean steamers ascend the Garonne to Bordeaux, the largest city on its banks, and at Toulouse it meets the Canal du Midi, which extends to the Mediterranean Sea. The Garonne is 400 miles long, and its drainage basin is 38,000 square miles in area.

GAR'RICK, David (1717–1779), the most famous of English actors. He was born at Hereford and educated at a grammar school in London. After an unsuccessful attempt to learn the wine trade in Lisbon became a pupil of Samuel Johnson, with whom he remained for seven years. In 1736, with Johnson, he went to London and there studied law for a time. He had always had a leaning toward the stage, however, and in 1741 he appeared for the first time. As Richard III he achieved, under an assumed name, a remarkable success, and from that time his name was associated with the production of Shakespearean plays. Garrick presented these dramas without the barbarisms and crudities which had crept into them since Shakespeare's time and his work constituted a virtual revival of the plays. Hot-tempered and jealous, he constantly made enemies among his colleagues and the critics, but his reputation as an actor remained unimpaired. He wrote a number of plays, of which the best is *The Lying Valet.*

GAR'RISON, William Lloyd (1805–1879), an American journalist and reformer, the founder of the antislavery movement in the United States. In 1827 he became editor of the *National Philanthropist,* the first American temperance journal. With Benj. Lundy, a Quaker, he later started at Baltimore a paper called *The Genius of Universal Emancipation,* and his open denunciations of slave traders led soon to his imprisonment for libel. On his release he started *The Liberator,* a weekly journal in Boston, which he published with the aid of one assistant. In 1832 appeared his *Thoughts on African Colonization,* and in the same year he established the American Antislavery Society. He subsequently visited England, where he was cordially received. Constant threats were made that if he did not discontinue *The Liberator* he would be assassinated, and in 1835 he was saved with difficulty from a Boston mob; but his principles made steady progress until 1865, when the Antislavery Society was dissolved, with its work accomplished. A volume of his sonnets and one of selections from his writings have been published.

GARROTTE, *ga rote',* or *ga rot',* an iron collar formerly used in Spain and Portugal in the execution of criminals. It was fastened to a post, in front of which the criminal sat, and at the proper time was placed on the victim's neck. By means of a screw the collar was tightened until the person died of strangulation. With other cruel devices, the garrote has become practically obsolete.

GARTER, Order of the. See Order of the Garter.

GARTER SNAKE, a name loosely applied to a number of different reptiles, which are found in various parts of North America. The best-known species, found from Guatemala to Southern Canada, is about three feet long and is striped with yellow and black. Though its bite is quite harmless, it will rush at a pursuer with open mouth and present quite a terrifying appearance. It brings forth its young alive and watches over them with great care, and it is said that the mother snake will allow her young to run into her mouth for protection until danger has passed by.

GARY, Elbert Henry (1846–), the executive head of the United States Steel Corporation, whose output annually exceeds the combined production of all the steel companies of Europe. He therefore directs a greater body of laborers than does any other man in the world. Gary was born in Illinois; he studied law in Chicago, and was a lawyer at the age of twenty-one. At thirty-six he was a county judge near Chicago, and later moved to that city, where in 1893 he became president of the Chicago Bar Association.

While in this post of honor he helped to organize the Federal Steel Company, and he was chosen as its president. Later, when the steel companies were organizing the United States Steel Corporation, which was soon to be known as the "steel trust," Gary was chosen as its president because he was the one able man in the group of executives who was not identified with any faction.

GARY, Ind., a city of Lake County, at the southern tip of Lake Michigan, twenty-five miles from Chicago. It was established by the United States Steel Corporation with the intention that it should become the home of the largest and most perfect steel plant in the world, and this end has been realized. The site of Gary in 1905 was a waste of shifting sand and scrub oak trees. Building operations were begun in 1906 by the Indiana Steel Company, a subsidiary company of the United States Steel Corporation. Other steel companies and subsidiary corporations, as well as independent companies, followed, and in 1911 there were over a dozen vast mills in the city. Principal among these are the American Bridge Company, the Universal Portland Cement Company, the American Sheet and Tinplate Company, the Coke By-products Company, a great branch of the Baldwin Locomotive Works, the American Locomotive Works, the American Car & Foundry Company and the National Tube Company.

The city is served by the New York Central, the Pennsylvania, the Baltimore & Ohio, the Michigan Central, the Wabash and the Elgin, Joliet & Eastern railroads. The Gary schools became famous throughout the world (see below). There is a fine Y. M. C. A., the Gary-Carnegie Library, a city-hall and several hospitals. The city water plant is owned by the steel corporation. The city was named for E. H. Gary (which see). Population, 1910, 16,802; in 1920, 56,378, a gain of 230 per cent. See UNITED STATES STEEL CORPORATION.

Gary School Plan, a course of study developed by Wm. A. Wirt, superintendent of public schools. It is the result of special conditions—the lack of equipment, and a large foreign population. The school day for pupils and teachers is eight hours. One-half of this time is given to the usual studies, one-fourth to domestic science, music, and manual arts, and one-fourth to physical training, games and plays. Above the third grade each subject is taught by a special teacher. There is no separate high school organization, and throughout the twelve-year course the pupil is allowed more freedom of action and thought than is customary in school. Another important feature is the small equipment needed, for while one portion of the children is on the playground another is in the classroom. The Gary plan has been tried in other cities, where it has not been as well received. After an experience of several months, New York rejected it in 1917.

GAS. All matter in the universe exists in one of three states: it is solid, liquid or gaseous. If a solid, it will neither flow nor expand, but will retain its form; if a liquid, it will flow; if a gas, it will expand in all directions, if unopposed. Liquids can be compressed but little; solids, almost not at all; gases may be greatly compressed. Such great pressure can be exerted upon gases that they will become liquefied (see LIQUID AIR). Solids and liquids are always visible; many gases are invisible, and many are odorless. Among the most common gases lacking visibility and odor are air, oxygen, hydrogen, nitrogen and carbon dioxide.

Although air is a gas, it is not popularly so considered; hence a common statement has referred to gas as "all permanently elastic fluids differing from common air." A better definition is that gas is any substance in an elastic, airlike state. Many gases are combustible, while others cannot be made to burn. Heat expands all gases, and cold contracts them. The density of a gas depends upon the pressure to which it is subjected; any increase in the pressure upon it decreases its volume. Two physicists, Boyle and Mariotte, announced the following law:

> The volume of a given mass of gas varies inversely with the pressure to which the gas is subjected [twice the pressure gives half the volume, etc.].

Another law applicable to gases is one announced by Charles, and is called Charles's law.

> The volume of gas maintained under constant pressure increases for equal increments of temperature by a constant fraction of its original volume; and this fraction is the same whatever the nature of the gas.

Gases do not obey these laws perfectly, but they are very generally applicable.

The liquefaction of gases is effected by the application of cold or pressure, or of the two combined. For any given pressure there is a particular temperature at which the gas liquefies. At a certain point, however, called by Andrews the *critical point of temperature,* the distinction between liquid and gas appears completely lost. At and above this temperature no pressure that can be applied will convert the gas into the form of a liquid, even though the volume is diminished by pressure so much as to make the density of the gas greater than that of the liquid obtained at lower temperatures. By 1878 all gases had been liquefied.

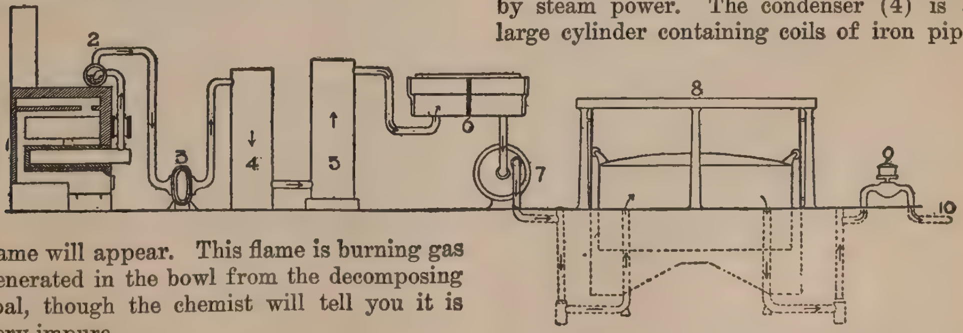
The power of motion inherent in all parts of airlike matter is accounted for by the *kinetic theory of gases,* according to which a gas consists of an enormous number of molecules moving about with very great velocity. Great as is their number, however, the molecules are sparsely distributed through space, in comparison with their distribution when the substance is in the solid or liquid condition. A molecule of a gas flying about moves on in a straight line till it meets another molecule, or till it touches a side of the containing vessel. Meeting another molecule, the two turn each other aside, just as two billiard balls when they come into collision are both deflected from their previous paths. Passing thence, each flies on in a straight line till it meets a fresh molecule, and each is again deflected. When the molecules strike on the side of a vessel that contains the gas, they rebound as a billiard ball does from the cushion of a billiard table; and the perpetual shower of molecules that strike and rebound from the sides give rise to the phenomenon of gaseous pressure, just as an umbrella held out in a hailstorm is pressed downward, owing to the numerous impulsive blows that act upon it. When the temperature of a gas is raised the energy of the molecules is increased.

Related Articles. Consult the following topics for additional information:

Gas, Illuminating Gas, Natural Gas Engine

GAS, Illuminating. The gas used in our homes for illumination is made principally from coal, and is called coal gas, but it can also be manufactured from oils derived from petroleum.

Coal gas is formed by the distillation, or decomposition, of coal, by a rather complicated process. Any boy can illustrate the principle in a crude way and prove that gas comes from coal. Fill a clay pipe with soft (bituminous) coal, seal the top of the bowl with wet clay and allow the clay to dry. Put the pipe in a hot fire, with the stem protruding. In a few minutes apply a lighted match to the end of the stem and a flame will appear. This flame is burning gas generated in the bowl from the decomposing coal, though the chemist will tell you it is very impure.

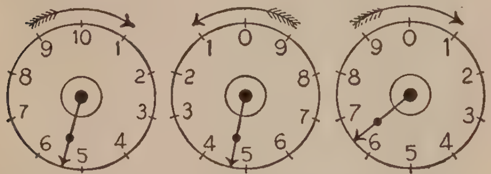


In the manufacture of gas great retorts are used as the boy uses the clay pipe in the above experiment. The retorts are filled with coal, sealed and subjected to great heat. The gas that is formed passes out of the retort through a pipe. It contains such impurities as ammonia, water vapor, sulphur, tar and carbon dioxide, and from it these must be removed by various purifying processes. Then the gas is passed to great storage tanks, ready for use. Pipes from these tanks convey it to streets and homes for lighting purposes.

The Manufacturing Process. The process in greater detail is illustrated in the drawing. The apparatus has the following principal parts: The furnace, 1, containing the retorts; the hydraulic main, 2, into which the gas flows from the retorts; the exhauster, 3; the condenser, 4; the scrubber, 5; the purifier, 6; the station meter, 7; the holder, 8; the governor, 9; the main, 10. The retorts are made of fire clay and are flat on the bottom and round on the top. They are usually nine feet long, twenty-six inches wide and sixteen inches high and have on the front end a cast iron mouthpiece fitted with a gas-tight door, also a delivery tube through which the gas flows. The retorts hold from 250 to 350 pounds of coal each. They are placed on shelves in the furnace so that the fire will surround them. There are usually six in a furnace. The delivery pipe leads to the hydraulic main, which is a large U-shaped pipe containing water.

The retorts are charged with coal, then closed and heated to redness. As the coal distills, the gas flows to the hydraulic main, where it passes through water and loses some of its tar and ammonia. It is drawn from the hydraulic main and forced through the remaining parts of the apparatus by the exhauster, which is a large gas pump operated by steam power. The condenser (4) is a large cylinder containing coils of iron pipe through which cold water is kept flowing. As the gas passes through this cylinder it is cooled and loses its tar and water vapor.

From the condenser it goes to the scrubber (5), which is another cylinder filled with coke, brushes, wooden grids or other porous material, over which a shower of water constantly flows. The gas enters the scrubber at the bottom and as it passes up through the cylinder it is brought in contact with the water, which absorbs any ammonia and deposits any tar that may have escaped the condenser. From the scrubber the gas passes to the purifier (6), which is a chamber containing layers of freshly slaked lime or of oxide of iron. These are placed one above the other on floors containing many small openings. As the gas is forced up through the lime or oxide, these compounds absorb any sulphur compounds which it may contain. It is now ready for use and passes through the station meter (7), which measures and records the number of cubic feet passing into the holder (8). The holder is a large cylindrical tank, made of thin iron plates having a dome-shaped top and open at the bottom. It is placed in a cistern of water from which it rises as it is filled with gas. The tank is surrounded by an iron frame, called the *guide frame,* upon the pillars of which guide pulleys run as the tank moves up and down. From the holder the gas passes through the governor (9), which is a device for controlling the pressure, to the main (10), from which it is distributed to the consumer.



FACE OF A GAS METER
The registers show 5,460 feet of gas used.

As gas enters the building in which it is to be used, it passes through a meter which registers the number of cubic feet consumed.

Water Gas. In many cities the gas furnished for illumination is called water gas. It is made by passing steam over red-hot anthracite (hard) coal or coke. The resulting gas is hydrogen and carbon monoxide, and it burns with a hot, blue flame. In that state it is not valuable for its intended use, but must be mixed with gas which emits a yellow flame. This mixture may be coal gas. After mixing, all impurities are removed, then it is stored in tanks, ready for distribution.

Historical. The first man to discover that gas for illumination could be derived from coal was William Murdoch, a Scotchman, in 1792. In 1805 he introduced it into the cotton mills of Manchester, England. It was first used in Paris in 1799, and in London in 1810. It was introduced into the United States at Baltimore in 1821. The next year it was used in Boston, and in 1825 was introduced into New York.

GAS, Natural, is gas that has been formed in the interior of the earth. Two theories are presented as to its origin. The first assumes the penetration of the earth by surface water, where it has been subject to chemical action at high temperatures. The second assumes the gas to have originated in the decomposition of organic matter buried in the rock formations of the earth's interior.

The gas fields of North America are extensive. In Canada they are in Alberta and Saskatchewan. In the United States they are widely distributed, as shown by the following list of states with gas-field areas of 100 square miles or over:

Pennsylvania	2750	Kentucky	290
Indiana	2460	Ohio	275
West Virginia	1000	Texas	130
Oklahoma	1000	Wyoming	120
New York	550	Louisiana	110
Kansas	550	Arkansas	100
California	310	Colorado	100

Nine other states have areas varying from twenty to eighty square miles. Wherever gas has been found great impetus has been given manufacturing, for this fuel is cheap and is easily conveyed to the consumer. Its cheapness led at once to wanton waste, which continued for years, on the possible assumption that the supply was inexhaustible. Wells have been left free to flow for long periods of time. An estimate of the gas wasted in one field in Louisiana in twenty-four hours is 75,000,000 feet, about twenty times as much is used by the entire city of Shreveport in the same length of time, and about one-thirtieth of the quantity of natural gas used in twenty-four hours by the entire United States. One wild gas-well at Oil City blew off for at least five years. These are but two instances of reckless misuse of a valuable fuel. In many cities where natural gas was furnished to homes for kitchen use the gas was allowed to burn continually in the stoves, owing to its ridiculously low cost. When some fields became exhausted or the pressure in the wells was greatly reduced, conservation measures were enforced.

How Secured. Natural gas was first found in America when oil wells were drilled. The drills struck vast pockets of gas, which sometimes shot upward with such force as to blow tools weighing 1,000 pounds out of the depths. After finding gas, as soon as possible the exit is capped, and the gas is conducted away from the field in pipes, for distribution to consumers. Occasionally a gushing well will be fired by lightning or by carelessness of workmen; such fires may burn for many weeks before being extinguished.

When the pressure is high the gas will reach the consumer through the pipes, unaided; when it is low, pumps are installed where needed, to force it along. Pipe lines in various sections carry gas over 150 miles.

GAS, Poison. See Poison Gas.

GASCONY, *gas′kon ni,* an old province of France, north of the Pyrenees Mountains. The Gascons, of mixed Basque and Gothic descent, had the character of being brave, faithful and peculiarly tenacious of purpose, but much given to boasting, whence the word *gasconnade.*

GAS ENGINE. A gas engine is an internal combustion engine, in which gas is exploded in an enclosed space (the cylinder) with a resulting instantaneous increase in pressure. One wall of the cylinder, which is air-tight, must be movable, so the added pressure resulting from combustion may perform work. The movable part is called a piston; it fits tightly into the cylinder, and when the gas is exploded it is forced outward, to be returned to its first position again by the operation of a crank shaft. There are as many pistons as cylinders in the engine; if four, the action of the pistons makes the application of power nearly continuous, but there is a slight break between the action of any two, in which for a brief instant no power is applied; if the engine contains six cylinders the power is continuous through the cycle, for before one piston ceases to apply power another has begun to apply it. The crank shaft, to which the pistons are attached, is kept revolving by means of the upward and downward piston movement.

Gasoline is the favored fuel of internal combustion engines, though types which burn kerosene are on the market. The gasoline is taken into the cylinders after being mixed with air and reduced to a fine spray, or vapor; this process of vaporization is explained in the article Carburetor. The vaporized gas is ignited by electric sparks, one at each cylinder head; this explosion raises the temperature of the gas to 1500°, or even 2500° in some engines, causing great expansion in volume, sufficient to drive the piston with a force of several hundred pounds to the square inch. The burned gas escapes through compression vents, and its place is at once taken by new gas. The electric impulse which explodes the gas may be derived from a battery, a magneto or a dynamo. The spark travels through special spark plugs to terminals located at the lower ends of the plugs in the vaporized gas, and it travels, or jumps, from one terminal to the other, thus igniting the gas.

The highest type of gas engines is found in the small compact automobile motor. Engines of this kind are also used in motor boats, motorcycles, tractors, etc., and they furnish power for many modern farm necessities. In small cities gasoline engines run printing presses.

GAS′KELL, Elizabeth Cleghorn (1810–1865), a British novelist, daughter of William Stevenson. She married in 1832 the Rev. William Gaskell, a Unitarian minister at Manchester. Her works comprise many novels, among them *Ruth, Cousin Phillis* and *Cranford,* this last a classic. *Her Life of Charlotte Bronte* is one of the finest of English biographies.

GASOLINE, *gas′o leen,* a liquid which looks like water but is lighter and is highly inflammable. It is dangerous to handle, for it is exceeding volatile—that is, it vaporizes quickly upon contact with the air. When this occurs the resulting gas may ignite if heated even by so small a flame as a burning match or a lighted cigar. Because of its explosive quality it is the favored fuel for internal combustion engines (see Gas Engine).

Gasoline is one of the numerous by-products of petroleum. In refining, the process is by fractional distillation. The petroleum is placed in stills and heated, first at comparatively low temperatures, then at higher temperatures. The oils pass off in order of their volatility—that is, their lightness, which means the point at which they will boil and thus vaporize. The first product is cymogene; the second, rhigolene; the third, petroleum ether; the fourth, gasoline. The first three are little known, except to chemists. Following this are naphtha and benzine, after which the products are kerosene and various grades of oils, such as cylinder oils, engine oils, etc., in numerous grades of lightness. One hundred barrels of crude oil will produce from five to seven barrels of gasoline of commercial grade.

Until the advent of the automobile the commercial demand for gasoline was slight. Great quantities were necessarily produced in the processes required to secure other readily merchantable products, and the price was as low as ten cents per gallon in 1914. In 1899 a production of 7,000,000 barrels more than supplied the market; in 1917 the output had increased to 45,000,000 barrels and there was a serious shortage, with the price from twenty-five to thirty cents a gallon. In 1918 the government of the United States put all gasoline-driven vehicles out of service on Sundays for seven weeks, east of the Mississippi River, except those of physicians and others whose public duties made driving necessary, that there might be a supply of gasoline sufficient for increasing government demands due to the World War.

GASTRIC, *gas′trik,* **JUICE**, a clear, colorless, acid fluid, with a salty taste, which has an important part in digestion. It is secreted by the mucous membrane of the stomach. Its most active elements are hydrochloric acid, pepsin and rennin. The first gives the juice its acidity, makes the other two elements more active, prevents decaying of the food, dissolves proteids and softens connective tissue; the rennin curdles milk; the pepsin changes proteids into peptones. Gastric juice does not act on oil or starch. After the food has become thoroughly mixed with the juice of the stomach, it is a thick, sticky substance, called *chyme,* ready to pass into the intestines. The amount of gastric juice secreted daily in the human adult is estimated to be fourteen pounds or more, but as it is continually reabsorbed, there is no great quantity present at any one time.

GASTRI′TIS, a disease which has its seat in the mucous membrane of the stomach. It occurs in a number of forms. A common one, called *acute catarrhal* gastritis, is accompanied by gas in the stomach, headache, nausea (with or without vomiting), and irregularity of the bowel movements. The stomach should be emptied with a tube or pump, and laxatives be given the patient. An attack usually yields to dieting and hygienic treatment.

GAS′TROPOD, or **GAS′TEROPOD**, a mollusk belonging to a class of which there are about 20,000 species, including snails, slugs and limpets. They have a headlike extension and move along by means of a disc on the under side of the body. See SLUG; SNAIL; MOLLUSK.

GATES, HORATIO (1728–1806), an American officer during the Revolutionary War, born in Essex County, England. He entered the English army and was with Braddock when the latter was defeated in 1755. On the conclusion of peace he purchased an estate in Virginia, where he lived until the Revolutionary War. Gates was appointed adjutant-general by Congress, with the rank of brigadier-general, and at the head of the American army of the North he compelled the British general Burgoyne to surrender his whole army at Saratoga (1777). The chief credit for this victory belongs, however, rather to Schuyler, Arnold and Morgan than to Gates. In 1780, after the capture of General Lincoln, Gates received the chief command of the Southern districts, but was defeated two months later by Cornwallis at Camden. He was then superseded by General Greene and brought to court-martial, but was finally acquitted and was reinstated in his command in 1782, after the capture of Cornwallis.

GATH, meaning *wine press,* was one of the five royal cities of the Philistines, which, from its situation on the borders of Judah, was of much importance in the wars of the Jews and Philistines. It was the native town of Goliath, and was successively captured by David, Hazael and Uzziah, who dismantled it. The site cannot be determined with certainty, but it is sometimes identified with Tell-es-Safiyeh, between Ekron and Ashdod.

GATINEAU, *gah te no′,* a river of Canada, in Quebec province, the largest branch of the Ottawa. It rises in several lakes and flows almost due south, entering the Ottawa nearly opposite Ottawa City. It is not navigable more than five miles above the Ottawa, except by canoes, but its rapid waters are well stocked with fish and are available as water power. Its length is 400 miles.

GAT′LING, RICHARD JORDAN (1818–1903), an American inventor, born in North Carolina. He showed mechanical skill at an early age and perfected several machines for the simplification of processes in cotton manufacture. His principal invention, however, was the revolving gun now known as the Gatling gun. This gun had a capacity of 350 shots a minute, and was a remarkable innovation at the time of its invention. See MACHINE GUN.

GAUGE, or **GAGE**, *gaje,* STEAM and WATER, instruments fixed to engine boilers for registering the force of the steam and the level of the water. The steam gauge consists of a cylindrical metallic box with a dial in front, over which a needle moves. A tube from the boiler connects with a movable piece of metal, which acts against a spring, gauged to indicate the pressure to the square inch in pounds. The higher the pressure, the more the spring is compressed. The needle is connected with the spring by a mechanism which causes it to move over the dial, upon which the pressure is marked in pounds. The water gauge is a vertical glass tube or flat case, communicating above and below with the boiler. Gauge cocks are sometimes used instead of or in addition to the tubes, for enabling the engineer to verify the level of the water. See BOILER.

GAUL, *gawl,* in ancient geography the country of the Gauls, the chief branch of the great original stock of Celts (see CELTS). Students of Latin are familiar with the famous description of the country, forming the opening lines of Caesar's *Commentaries:* "All Gaul is divided into three parts," etc. Gaul extended at one time from the Pyrenees to the Rhine and included also a part of Italy. The part on the Roman side of the Alps was called *Cisalpine Gaul* (meaning *Gaul on his side*). Later, the name was restricted to *Transalpine Gaul,* or the country corresponding nearly to modern France.

Migrations among the Gauls about 397 B. C. first bring the Gallic nation into the region of history. Having crossed the Alps, they fell upon the Etruscans, defeated the Romans at Allia (390 B. C.) and sacked and burned Rome. More than a century after the burning of Rome the eastern Gauls made three destructive invasions into Macedonia and Greece. Several tribes settled in Asia Minor, where, under the name *Galatians,* they long retained their national peculiarities. After these migrations the Gauls along the banks of the Danube and in the south of Germany disappeared.

In the years 128–122 B. C. the Romans conquered the southern part of Transalpine Gaul, along the sea from the Alps to the Pyrenees, and here established their dominion in what was called the Province, a name that still exists as Provence. When Julius Caesar was appointed to the proconsulship over the countries bordering on Gaul, he resolved to subject all Gaul and carried out his purpose in less than nine years, 58–50 B. C., in eight bloody campaigns. See CAESAR.

GAUNTLET, *gahnt′let,* a glove usually made of leather and covered with iron, used by medieval knights. The metal parts were so joined that the hand could open and close. To throw down the gauntlet before an antagonist was a common method of declaring a challenge.

GAUTAMA, *gow′tah mah.* SEE BUDDHA.

GAUZE, *gawz,* a thin, transparent cloth of open texture, made plain, figured and striped, and of cotton, linen or silk. Cotton gauze is used extensively for bandages and surgical dressings. Some of the choicest gauze fabrics are made in China, and have silver and gold flowers worked on a foundation of silk. The thin cotton, linen or silk fabrics used in making summer underwear are known as gauzes. Gauze fabrics obtain their openness of texture through a special kind of weaving. The warp threads are twisted in pairs alternately from left to right and vice versa, after each shot of the weft threads. As a result the weft passes through a series of loops in the warp, and the threads are kept the same distances apart.

GA′VIAL, the crocodile of India, characterized by the long, narrow, almost cylin-

GAVIAL

drical snout. It sometimes reaches a length of twenty feet. Its teeth, about 120 in number, are of equal length, and its feet are webbed. It feeds on fish and other small prey. The males can be distinguished from the females by the large lump upon the snout, in which the nostrils open. The only living species is found in southern and eastern Asia, especially in the Ganges. See CROCODILE.

GAVOTTE, *ga vot′* a musical air for a special dance, consisting of two strains, each of four or eight bars in 2/4 or 4/4 time, the starting notes occupying half a bar. Like the minuet, it has been introduced for free treatment into complex musical compositions. The name is said to be derived from Gavot, an inhabitant of Gap, France.

GAY-LUSSAC, *gay lu sak′*, LOUIS JOSEPH (1778-1850), a French chemist, one of the most noted scientists of his day. Perhaps the most important of his many discoveries was his announcement that oxygen and hydrogen unite in proportions of one to two to form water. This led to the discovery and announcement of the law of volumes, which is one of the most important discoveries in the domain of chemistry (see CHEMISTRY). He gave attention to the application of chemical laws and theories to practical purposes. Owing to the great benefits resulting from his labors, Gay-Lussac was the recipient of many honors. He also occupied important educational and government positions and in 1839 was made a peer of France.

GAZA, *gah′za,* SYRIA, an ancient town located three miles from the Mediterranean Sea and fifty miles southwest of Jerusalem. It was once the most important city of the Philistines, who had conquered it from Egypt. Later it was taken by Alexander the Great, and it was destroyed in 96 B. C.; but it continued a center of Greek culture until nearly A. D. 700. The modern city of Ghazzeh is an important station in the caravan communication between Egypt and Syria. During the World War the place was captured by British troops (1917). Population, 1911, about 40,000.

GAZELLE, *ga zel′*, a group of small graceful antelopes, of which there are over twenty species. The color of the back is a light fawn, deepening into dark brown in a wide band which edges the flanks and forms a line between the upper portions of the body and the pure white of the abdomen. The eye of the gazelle is large, soft and lustrous. Both sexes are provided with horns, which are round, black and about thirteen inches long. Gazelles seem to be confined to the north side of the Atlas Mountains, Egypt, Abyssinia, Syria, Arabia and South Persia. The common gazelle, sometimes called the *ariel,* or *dorcas,* is brown in color. It is easily tamed. Other species are *Loder's gazelle, Grant's* and the *Indian chinkara,* or *ravine deer.* See ANTELOPE.

GEARING, *geer′ing,* in machinery, the parts, collectively considered, by which motion communicated to one portion of a machine is transmitted to another. It is generally a train of toothed wheels. There are two chief sorts of wheel gearing, *spur gearing* and *beveled gearing.* In the former the teeth are arranged round either the concave or convex surface of the wheel, and are of equal depth throughout. In *beveled gearing* the teeth are placed upon a beveled surface round a wheel, which, if the slope of the bevel were continued, would form a cone, the teeth sloping similarly. Spur gearing is used when the axles of the wheels are parallel, and beveled gearing is used when the axles are at right angles to each other.

GECK′O, one of a family of lizards characterized by general flatness of its body and head. The body is covered on the upper part with numerous round warts. The feet are short; the toes, of nearly equal length, are furnished with flattened sucking pads, by means of which the animals can run up a perpendicular wall or even across a ceiling after the manner of flies. It is nocturnal in habits. The animals are common in North Africa and Southern Europe.

GECKO

GEHEN′NA, or **VALLEY OF HIN′NOM**, a valley lying southwest of Jerusalem. It was anciently used as a place of idolatrous rites, where children were sacrificed to Moloch. After the time of Josiah, king of

Judah, it became a depository for sewage and filth. In the time of Christ the word *Gehenna* was synonymous with *hell,* the place of the lost.

GEIBEL, *gi'bel,* EMANUEL (1815–1884), a German poet. He studied at the universities of Bonn and Berlin and lived a year or two in Greece, but from 1852 to 1869 was honorary professor of aesthetics and poetry in the University of Munich. He published several translations from the Greek and numerous original works, including plays and poems. Of the former the most successful were the tragedies *Brunhild* and *Sophonisbe,* and of the latter there were collections of political verse, love-songs and lyrics. His fame rests on his lyrics, which are popular in Germany.

GEIKE, *gee'ky,* ARCHIBALD, Sir (1835–), a British geologist, born in Edinburgh. After graduation at the University of Edinburgh he became a member of the Geological Survey of Scotland, of which he was later made director. Having served for eleven years as Murchison professor of geology and mineralogy in Edinburgh, he became director of the Museum of Practical Geology in London. He was elected president of the Geological Society of London and served as president of the British Association for the Advancement of Science. In 1897 he came to America and delivered a series of lectures at Johns Hopkins University. Among his important works are *A Text-book of Geology, Ancient Volcanoes of Britain* and *The Foundations of Geology.* Geikie is considered one of the highest authorities on geology. His text-books are used not only in England and the United States, but have been translated into nearly every European language.

GEISSLER'S, *gyes'lerz,* **TUBE,** a laboratory apparatus, named after Heinrich Geissler, by whom the tubes were first constructed. The tube is made of very hard glass and has a platinum wire sealed into each end to serve as an electrode. It is filled with rarified gas, such as nitrogen, oxygen or hydrogen. When the electrodes are connected with opposite poles of an electric machine or induction coil, an electric current passes through the tubes, giving rise to brilliant light effects. Geissler's tubes are made in different shapes and are much used in scientific research. They are valuable for examining various incandescent gases with the spectroscope.

GELATIN, *jel'a tin,* a transparent substance obtained from animal connective tissue, such as skin, hoofs, horn and ligaments. When placed in cold water gelatin forms a jellylike mass, but in hot water it dissolves easily. Gelatin in its purest form is found in the air bladder of the sturgeon; this is one kind of isinglass (which see). It is used in making blanc-mange and jelly, and as a thickener of soups. Glue is made from coarser forms of gelatin, obtained from hoofs and hides; and that from skin and finer membranes forms the "sizing" used in stiffening silks. Gelatin is also utilized in the manufacture of cements and court plaster, in preparing copying pads for such machines as the hectograph, and in photography.

GELEE, *zhe la',* CLAUDE (1600–1682), a French landscape painter and etcher, generally known as Claude Lorrain. After studying in Naples and Rome, he traveled through Germany and France, then returned to Italy and settled in Rome, where he enjoyed the patronage of the popes Urban VIII and Clement IX. Among his famous paintings are the *Embarkation of Saint Ursula,* in the National Gallery, London; the *Finding of Moses,* in the Madrid Gallery; the *Expulsion of Hagar,* at Munich, and the *Village Dance* and the *Landing of Cleopatra at Tarsus,* in the Louvre, Paris. His pictures are noted for the brilliant effects of light reflected in the sky, clouds and water and for the poetic feeling shown in his interpretations.

GELSEMIUM, *jel se'mi um* or **YELLOW JASMINE,** a shrub of the Southern states, with opposite, lance-shaped, shining leaves and sweet-scented yellow flowers. From the root the drug gelsemium is obtained.

GEMINI, *jem'i ni,* a constellation, so named from its two bright stars, Castor and Pollux. The name is the Latin word for *twins.* Gemini is the third sign of the zodiac. The sun is in the constellation of Gemini from the twenty-first of May to about the twenty-first of June. The symbol of Gemini is ♊.

GEMS, *jemz.* See PRECIOUS STONES.

GEMS, ARTIFICIAL. The great value of gems led to their imitation in all ages. The Egyptians, who understood the art of coloring glass, made excellent imitations of the most costly precious stones known to them. The Romans used powdered rock crystal in imitating gems, and their counterfeits were so successfully made that it was difficult to distinguish them from the genuine article. The alchemists of the Middle Ages also produced excellent imitations of the emerald, ruby, sapphire and topaz.

Modern imitations are of glass, usually known as *paste* or *strass*. This glass contains a large proportion of oxide of lead in its composition, and this makes it remarkably clear and brilliant. It is colored to imitate the most highly-prized precious stones, by the same process that is used in making colored glass (see GLASS). When clear, paste resembles the diamond, but it is soft and can be easily scratched, so that by testing it with a quartz crystal or piece of hard steel, it is easily detected.

Imitations are also produced by using cheaper stones, having close resemblance to the genuine. Clear quartz and white Brazilian topaz, as well as colorless varieties of the sapphire and emerald, are often sold for diamonds. Cheap stones are also colored to resemble carnelians and agates. All of these imitations are skilfully prepared, and one not conversant with the methods of testing gems is liable to be deceived if he makes purchases of unreliable dealers.

Diamonds have been successfully made by chemical process. The product was thoroughly satisfactory, but the stones were all very small and the experiments were attended with so great expense as to make their production impracticable for commercial purposes. In Paris a process is employed successfully in making rubies, and about 5,000,000 carats of real rubies are made there every year.

GENDARMES, *zhahN dahrm′*, the name originally given in France to the whole body of armed men, but after the introduction of standing armies to a body of heavy-armed cavalry, which composed the chief strength of the forces. Gendarmes are now the French armed police.

GENEALOGY, *jen e ahl′o ji*, the science which deals with the origin and history of families and dynasties. Books of genealogy with lists showing the descent of various families are in the archives of all historical libraries, and are consulted by those interested in tracing their ancestry. Historians find the science of genealogy of great service, especially in their investigations of ancient records. There are several genealogical lists in the Old Testament.

GENERAL, a high military title, bestowed on officers in general command, or high command, of armies. There are four grades—brigadier-general, in charge of a brigade; major-general, at the head of a division; lieutenant-general, a title sometimes not bestowed, but when in commission, given to the head of an army or an army corps; general, in full command and ranking every other officer.

The general is next below field marshal in the British and German armies and next below marshal in the army of France. In the United States the rank of general is the highest military honor. It has been held by only five men—George Washington, Ulysses S. Grant, William Tecumseh Sherman, Philip Sheridan and John Joseph Pershing. The salary of a general is now $13,500 per year.

See, in alphabetical order, the various grades of general referred to above.

GENERAL EDUCATION BOARD, an organization chartered by Congress in 1903, whose function is the distribution of funds donated by John D. Rockefeller for educational purposes. Rockefeller contributed a total of $50,000,000, of which $30,000,000 was set aside as an endowment fund. Money has been donated by the Board to advance the following lines of work: the promotion of practical farming in the South; the establishment of public high schools in the Southern states; the promotion of colleges and universities in various sections of the country; the promotion of schools for negroes.

GENERAL STAFF, a group of army officers who work out all important army plans. The idea originated in the German army, where the group is called the Great General Staff, and it has been followed in other countries.

The General Staff of the United States army consists of thirty-eight officers, who serve in such capacity for four years and then return to positions of command in the army organization. The Staff includes four general officers, headed by the chief of staff, four colonels, six lieutenant-colonels, twelve majors and twelve captains.

GENESIS, *jen′e sis*, the first book of the Bible and of the Pentateuch. The name, meaning *creation*, or *birth*, was applied by Greek translators. For some of the stories in *Genesis*, see BIBLE, subhead *Bible Stories*. *Genesis* consists of two great but closely connected divisions: 1, the history of the creation, the fall of man, the flood, the dispersion of the human race; 2, the history of the fathers of the Jewish race.

GENET, *zha na'*, EDMON CHARLES EDOUARD (1765–1834), a French diplomat who caused the first international crisis which confronted the American republic. After serving as an attaché of the French embassies at Berlin, Vienna, Saint Petersburg and Amsterdam, and having held other government offices, he was named, in 1793, as minister plenipotentiary to the United States. He was enthusiastically received, but soon brought opprobrium upon himself by securing recruits for France, thus clearly leading the United States to violate its neutrality in the war between France and England. Consequently, President Washington notified him that his activity must cease. He disregarded this warning, however, until his recall was demanded of the French government. Genet, who had allied himself with the Girondists, feared to return to France. He became a naturalized citizen and settled in New York, where he married a daughter of Governor George Clinton.

GENEVA, LAKE OF, or **LAKE LEMAN**, *le mahn'*, the largest of the lakes of Central Europe, lying on the boundary between Switzerland and France. It has the form of a crescent and is traversed by the River Rhone. Its length is forty-five miles, its greatest width is eight miles, and it is 1,150 feet above the sea. The waters of Lake Geneva are of a beautiful blue color, the scenery on its shores is remarkably beautiful, and the region is visited yearly by thousands of tourists. Near the eastern end is the Chateau which served as a prison for Bonnivard, hero of Byron's *Prisoner of Chillon.* See CHILLON.

GENEVA, N. Y., founded in 1796, is a city in Ontario County, near the geographical center of the state, at the northern end of Seneca Lake. Rochester is fifty miles northwest. The city is on the Seneca & Cayuga Canal and on the New York Central, the Lehigh Valley and other railroads. It has a beautiful location above the lake and is the seat of Hobart College (for men) and William Smith College (for women) and of the state agricultural experiment station. Here is a branch of the American Can Company, and there are also manufactures of optical supplies, cereals and other articles, besides extensive nurseries. It was chartered as a city in 1898. Population, 1910, 12,446; in 1920, 14,648.

GENEVA, *je ne'vah*, SWITZERLAND, a city of many historic associations, situated at the western extremity of Lake Geneva, at the outlet of the River Rhone. This stream divides the town into two portions, the larger and more important of which is on the left, or south, bank. Geneva was formerly surrounded by walls and strong fortifications, but since 1850 these have been removed. There are also an upper and a lower town. The former consists of well-built houses and handsome hotels; the lower town is the seat of trade and the residence of the poorer classes. The most important buildings are the cathedral, or Church of Saint Peter (built in the eleventh century); the townhouse; the Musée Fal; and Musée Rath and the university building. Geneva is a famous center for the manufacture of watches, musical boxes and jewelry. It has ample railway communication, and is one of the principal cities through which tourists and travelers enter Switzerland.

In literature and science it has long occupied a distinguished place, and it was the birthplace or the residence of many eminent men, including Calvin, Knox, Le Sage, Necker and Rousseau. In 1919 Geneva was chosen the capital of the League of Nations, by the peace conference. Population, 1920 census, 135,059.

The canton of Geneva, of which the city is the capital, has an area of 109 square miles, and is in the basin of the Rhone. Population, 1920, 171,000.

GENEVA ARBITRA'TION, the arbitration of a controversy between the United States and Great Britain, growing out of the depredations of the privateer *Alabama* and other Confederate vessels against commerce during the Civil War (see ALABAMA CLAIMS). The tribunal was provided for by the Treaty of Washington in February, 1871.

GENEVA CONVENTION, a meeting of delegates from various European powers at Geneva, Switzerland, in 1864, for the purpose of bringing about an international agreement with respect to the care of sick and wounded soldiers in time of war. It was specified that hospitals and ambulances should be regarded as neutral so long as they had sick or wounded in them; that all persons engaged in caring for the sick and wounded should be regarded as neutral; that any family which received and cared for sick soldiers should be by that fact absolved from the necessity of quartering troops; that wounded men should be allowed, when cured, to return to their own country on condition of not bearing arms during the remainder of the war; that the insignia of the service should be the distinguishing mark of all ambulances and hospitals, as well as of members of the staffs. The articles of the agreement were subscribed to by every European country and by Persia, but in the World War (1914–1918) were openly and continually violated. See RED CROSS.

GENGHIS KHAN, or **JENGHIS KHAN**, *jen′gis kahn′* (1162–1227), the first great Mongol conqueror. He was originally named TEMUJIN, but later was called Genghis Khan, a name signifying *great ruler*. He succeeded his father when only thirteen years of age. After much terrible warfare with the Tartars, he was proclaimed kahn (ruler) of the united Mongol and Tartar tribes. In 1225 Genghis marched in person at the head of his army against the king of Tangut (Southwestern China) and totally defeated him. Two of his sons conquered Northern China. At his death his immense dominions were divided among his four sons.

GENII, *je′ni i,* imaginary deities, the ruling and protecting powers of men, places or things. According to the belief of the Romans, which was common to almost all nations, every person had his own genius; that is, he had a spiritual being, which introduced him into life, accompanied him during the course of it and again conducted him out of the world at the close of his career.

The term is applied in the *Arabian Nights* to mysterious spirits who exercised great power for good or evil. Aladdin was assisted by genii who came to help him whenever he rubbed his magic lamp. See ARABIAN NIGHTS.

GENNESARET, *jen nes′sa ret,* LAKE OF. See GALILEE, SEA OF.

GENOA, *jen′o ah,* ITALY, capital of the province of Genoa, and one of the chief commercial cities of the kingdom, is beautifully situated on the northern shore of the Mediterranean Sea, 100 miles southeast of Turin. Encircled by verdure-clad hills and the heights of the Ligurian Apennines, whose summits are crowned with forts and batteries, it well deserves its name *La Superba* (the Proud). Genoa is distinguished, too, for its architectural beauty, while historically it is famed as the birthplace of Columbus, discoverer of the New World.

The older part of the city is a network of narrow streets that wind up and down the steep hills, but the modern boulevards that encircle or radiate from it are broad and handsome. One of the city squares is the meeting point of all the electric car lines, some of which carry passengers to the suburbs through tunnels. Many splendid palaces and churches give Genoa an aspect of grandeur possessed by few other Italian cities. It has an excellent modern harbor, and exports each year goods valued at nearly $100,000,000.

Under the Romans Genoa was famous as a seaport. After the breaking up of the empire of Charlemagne, it constituted itself a republic, presided over by doges. From 1119 it was almost constantly at war with Pisa down to 1284, when Genoa inflicted a crushing defeat on Pisa. The rivalry between Genoa and Venice was a fruitful source of wars during the twelfth and fourteenth centuries. Meanwhile, the city was disturbed by civil discord and party strife. In 1528 tranquillity was regained, and there was peace until the end of the eighteenth century.

The form of government established was a strict aristocracy. Little by little Genoa lost all its foreign possessions. Corsica, the last of all, revolted in 1730 and was ceded in 1768 to France. In 1797 a democratic constitution was adopted, and the Ligurian Republic was formed. After the Battle of Marengo (1800) Genoa was taken possession of by the French. In 1805 it was formally annexed to the empire of France and ten years later, to the kingdom of Sardinia, with which it has become a portion of the kingdom of Italy. Population, 1915, estimated, 300,139 (with suburbs).

GENRE, *zhahN′′r,* **PAINTING**, a style of painting which has for its subject scenes of every-day life, as distinguished from historical, romantic or other subjects. The greatest masters of genre have been the Dutch, and of these the most distinguished were Franz Hals, Rembrandt, Jan Steen, Ter Borch and Von Ostade. Others who charmingly depicted the common scenes of daily life were Hogarth in England and Valasquez and Murillo in Spain.

GENTIAN, *jen′shan,* a genus of plants having opposite, strongly-ribbed leaves and blue or yellow flowers. The calyx consists of four or five segments, and the corolla has four or five petals. The fruit is a two valved, one-celled, many-seeded capsule. Gentians are for the most part natives of hilly or mountainous districts. The root is used medicinally. Some species grow wild in the United States and Canada, among them the beautiful blue fringed gentian of the Northern states.

GENTILES, *jen′tylz,* a term applied in ancient times to peoples other than the Jews. Paul was called the "Apostle to the Gentiles" because he preached to outside races, and the early Church had many more Gentile members than Jewish adherents. At the present time the Mormons designate as Gentiles all outside the Mormon faith.

GENUS, *je′nus,* in botany and zoölogy, a group of species possessing certain characters in common, by which they are distinguished from all others. A genus is of lower rank than *order* or *family.* A single species, possessing certain peculiar characters which belong to no other species, may also constitute a genus, as the giraffe. In naming plants and animals, the generic name is given first, as *Felis leo.* Here the name *Felis* is the generic name and shows that the lion belongs in the cat genus. *Leo* is the specific name. When written the generic name is often abbreviated, as *F. leo.* See FAMILY; ORDER.

GEOGRAPHY, *je og′ra fi,* the science which describes the earth in its present condition, including the distribution of plants and animals on its surface, and treats of it as the home of man. For purposes of study it is usually divided into three general departments, namely, *physical, mathematical* and *political* geography. The first is known also by the name of *physiography.* Some authorities add a fourth: *economic,* or *commercial,* geography. The subject in all its parts is one of the most important branches taught in the public schools, for it is closely related to various other branches of natural science.

In determining the form, measurements and motions of the earth, it depends upon principles and laws discovered by astronomy. In describing the earth's surface and the material of which it is formed, it touches upon geology, and it draws upon botany and zoölogy in its discussion of vegetable and animal life; while in treating of man it depends for many of its facts upon ethnology, and it is also the foundation upon which history largely rests. Nevertheless, geography is not simply a collection of facts obtained from these various branches of science, but it is in itself an exact science, based upon principles and laws which have been discovered by comparing the results obtained from the sciences with which it is so closely related.

Physical Geography, or Physiography. The scientists of the world classify known facts of physical geography from the viewpoint of to-day. The physical history of our planet does not belong here, but is discussed in geology as has been stated. The relations of our earth to other members of the solar system, as well as the measurements referred to above, are treated in astronomy. There is left, then, to be included in physical geography a study of the external appearance of the earth, and the changes wrought in land, water and air; the causes of the seasons and of the tides, the meaning of great earthquakes and of other oft-recurring phenomena.

Mathematical Geography. In mathematical geography man has adapted his carefully developed rules to physical conditions as he finds them. In our lives we find necessity for some knowledge of the simpler mathematical elements of the subject; so under the general term mathematical geography we study the earth as to its shape and its motions, the scheme of its measurement, the changing of its seasons and their length, the alternate rise and fall of the tides, and make graphic representations of all these, which we call maps and charts.

Political Geography. A part of geography is man-made. It is an interesting study to learn what part, and why, and how. In this sense geography and history are united and must be viewed together. The divisions of political geography result from the social and economic activity of the human race, influenced here and there materially by physical conditions. Political geography, then, is that branch of the subject outlining human governments, treating of boundaries of states and nations and the locations of cities, and pictorially preserving the present day results of the great events of history.

Commercial Geography. Some authorities take from political geography some of its features and shape them into economic, or commercial, geography, which treats of commodities, their places of origin, the world-wide demand for them, means of transportation, trade routes, etc.

An Intimate View. It may be assumed that the student desires quite fully to cover the general subject of geography. He will find it intensely interesting. The world is his home; in men of all tribes and races he should have an interest, and of them should possess some knowledge. He may never have traveled far from the place of his birth, but is free to follow his inclination and mingle in a way with strange peoples and even live among them. Business interests may demand specific knowledge of some faraway corner of the world; the news of the day is best interpreted through positive information previously gained of places and peoples—everything practical in our experience or even within the range of possibility points to the need of precise geographical knowledge. In its study the more intimate view is desired—comparisons and contrasts of things unknown and distant with things which we know and understand. So, if you accept the brief outlines below for plans of study, by investigations based upon local knowledge to supplement what you read you should come to a better understanding of some of the world facts which you have viewed heretofore largely in the abstract. This spirit of personal investigation into relations and conditions finds explanation and partial elaboration in later pages devoted to this subject.

Study by Topics. Promiscuous reading is not to be commended, except in search of important news of the day and in getting the substance of leading magazine articles. When one turns to the serious questions involved in study, time is ill spent except when a definite plan is followed, by which, step by step, the whole of a topic or subtopic is covered. Confining ourselves just now to geography, let us suggest briefly how to arrange reading and study programs, based entirely upon information clearly set forth in these volumes.

The Weather, an Example. No more intimately related subjects may possibly be suggested than those connected with the weather. The topic is not exhausted when you have instinctively turned to the article *Climate* and have mastered it. The foundation only has been laid. Associated with this topic are related articles on *Wind, Rain, Cloud, Weather Bureau, Meteorology,* and the like. If you are ambitious, you will take them in order and become familiar with them.

Further, there are various winds, described under their respective titles. As you read, topic by topic, cross-references to still other titles are given, none of which should be ignored. For example, the article *Cloud* contains a reference to *Fog,* in addition to others already brought to your attention. When reading about *Winds* you are referred to *Storms,* and under *Storms* attention is called again to the various severe winds, that no important item may possibly be overlooked by the investigator.

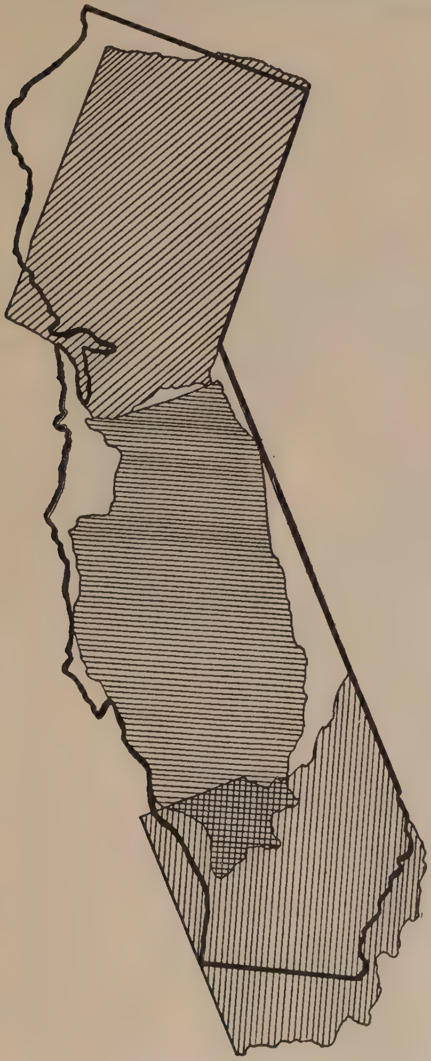
Interest in the subject will doubtless increase with the lengthening of the inquiry. Therefore it is determined to go very fully into every subject dealing with the weather. Under Geography the following topics, alphabetically arranged, are suggested as relating to the investigation at hand:

Atmosphere
Blizzard
Calms, Region of
Chinook
Climate
Cloud
Cloud Burst
Hail
Haze
Horse Latitudes
Humidity
Hurricane
Isobars
Isothermals
Khamsin
Land and Sea Breezes
Lightning
Monsoon
Norther
Cold Wave
Cyclone
Dew
Doldrums
Etesian Winds
Frost
Fog
Prevailing Westerlies
Rain
Rainbow
Simoon
Sirocco
Storms
Temperature
Tornado
Trade Winds
Typhoon
Whirlwind
Wind

Having the list completed, rearrange it so all winds shall be grouped together, and thus may be studied together, as follows:

Chinook
Etesian Winds
Hurricane
Land and Sea Breezes
Monsoon
Norther
Prevailing Westerlies
Simoon
Sirocco
Squall
Tornado
Trade Winds
Typhoon
Whirlwind

Some topics will bring others to mind which have no relation to geography: *Temperature* suggests *Thermometer; Storms* suggest *Barometer,* and these will be transferred to your list. This group of forty-two articles, topically arranged and carefully studied, will give any family circle material for several evenings of profitable investigation, or will provide work in school calculated to give a class a really broad view of this common, yet not generally well-known, subject. The weather is only one of many themes which may be treated in this way with great profit. In no other way can the ill effects of haphazard reading be overcome.



SOME INTERESTING COMPARATIVE AREAS

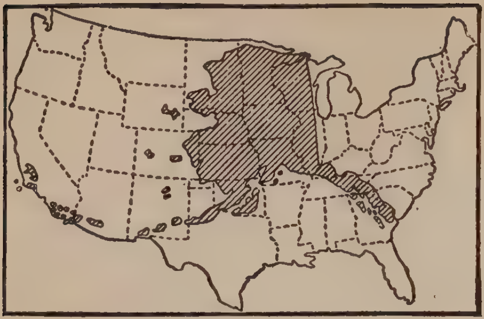
A Study in Areas. We are all advised to see our own country first, the intimation being that most of us do not know very much regarding it, that there are natural objects at home rivaling the great views in Europe, and that it would be embarrassing to a North American abroad to have to admit he knew nothing of some of his home wonder-spots. Millions of men and women, not to mention boys and girls, admit ignorance even of the more commonplace details of home geography. For instance, until we place Ohio, Illinois and Iowa, three of our greatest and richest states, within the boundaries of California, with additional room for almost all of Connecticut, the magnificence of the American republic is not realized. New York is called "The Empire State," but by right of commercial supremacy and wealth rather than of size. Only eighteen states of the Union are smaller; Colorado is larger than two New Yorks and two Delawares, with Rhode Island thrown in for good measure. Alberta is about as large as Texas; Ontario is as large as France and Germany combined; Saskatchewan covers as great an area as Austria-Hungary in the days of its greatest extent. Ohio and Iceland are of about the same size, and Nevada is as large as Italy.

With respect to this phase of geography boys and girls study too much in the abstract. More than half of them live east of Indianapolis; they believe Kansas to be a western state, whereas it is in the geographical center of the United States. This fact known, one begins to realize what must lie farther west. Then, too, Kansas may be considered somewhat of an empire itself, as it is sixteen times as large as Connecticut, nearly twice as large as Pennsylvania, and as large as both Kentucky and Tennessee.

Our usual conception of Alaska is that it is a small area at the extreme northwest of the continent. The illustration on page 1464 will correct a false impression. The maps are drawn to the same scale.

Alaska has almost 591,000 square miles. Grasp what these figures mean by a half dozen problems in area similar to those above. Texas is not half as large as Alaska. yet is so large that if France were an island in a sea the size and shape of Texas no farther shore could be seen in any direction.

Problems Without Figures. Attempt to answer all the following questions without



COMPARATIVE AREAS OF ALASKA AND THE UNITED STATES

assistance; then resort to authorities for verification. Some of the facts brought to light will be surprising:

1. A straight line drawn directly south from Chicago would reach how far, if as long as Montana from east to west?

2. Draw a straight line through Texas measuring its greatest length. How does it compare with a line similarly drawn througl California?

3. Extend such a line from the northernmost point of Maine down through New York City; to what point along the Atlantic coast will it reach?

4. If Chicago's population were transferred to an area the size of New Mexico, how many people would be placed in each square mile?

5. Compare England, Ireland, Scotland and Wales in size with Nevada; with Arizona.

6. Is Germany larger than any state of the American Union or of any province of Canada?

Tables for Comparisons. Especially helpful in reaching an understanding respecting comparative areas, density of population and other interesting data are tables like the following. One European country, the United States, Canada and your own state are compared; then in alphabetical order all the countries in a continent are arranged, to be compared with the three above them. This chart may be varied, and the lessons learned from each new compilation will be valuable:

COUNTRY	AREA IN SQUARE MILES	POPULATION IN ROUND NUMBERS	POPULATION PER SQUARE MILE	MILES OF RAILROADS
France	212,659	40,000,000	184.	25,168
United States	3,000,000	106,000,000	35.5	265,000
Canada	3,600,000	8,800,000	2.4	39,000
Illinois	56,000	6,500,000	115.	12,300
Argentina	1,153,000	8,700,000	7.5	22,600
Bolivia	514,000	2,900,000	.17	1,400
Brazil	3,275,500	30,645,000	9.3	18,000
Chile	290,000	3,750,000	14.	5,500
Colombia	441,000	5,900,000	13.3	900
Ecuador	116,000	2,000,000	17.	400
Guiana, British	90,000	300,000	3.	100
Guiana, Dutch	46,000	113,000	2.2	40
Guiana, French	32,000	50,000	1.4	..
Paraguay	76,000	1,000,000	13.	270
Peru	722,000	5,000,000	7.	2,000
Uruguay	72,000	1,500,000	20.7	1,600
Venezuela	400,000	2,400,000	6.	650

Suggested by the Chart. How does the size and population of French Guiana compare with your own state? What percentage of Guiana's population are convicts?

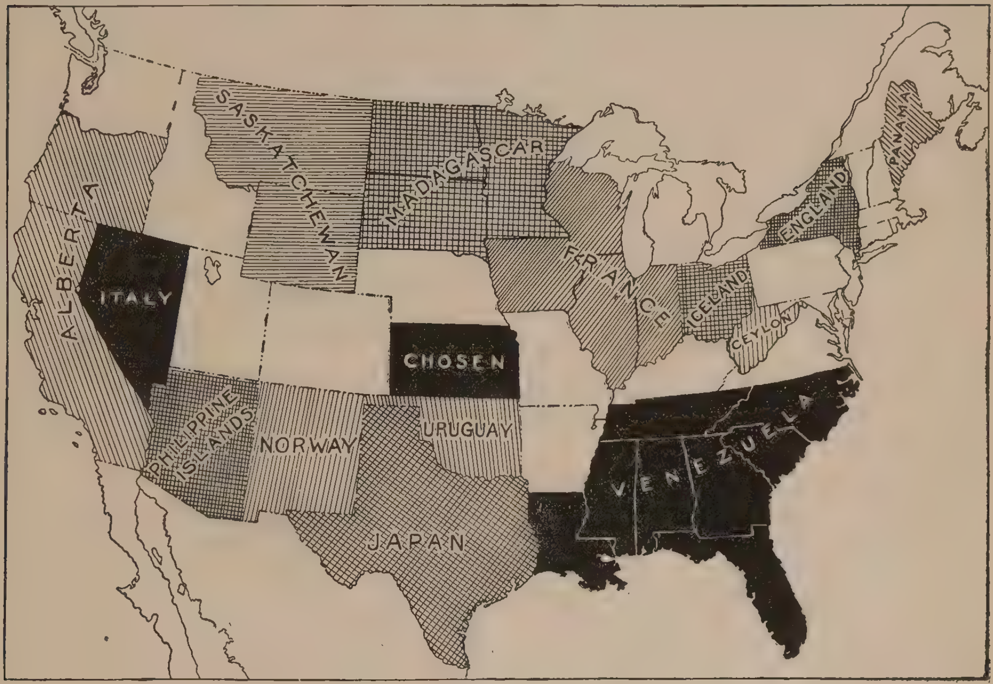
If Brazil's population should suddenly increase five times, how would it compare with that of the United States? Which has the larger area?

Which has more miles of railroad, Brazil or Illinois? Brazil or your own state?

If Canada were as thickly populated as Germany what would be its population?

How many South American countries have a smaller population than New York City? Than Boston? Than Seattle?

The above suggestions open a wide field to the ingenuity of teachers, parents, and the children themselves. Out of such exercises will come a better understanding of the greatness of our national domain.



SOME COMPARATIVE AREAS

Political Divisions. Earlier in this discussion it was stated that political divisions are almost entirely man-made. In a sense this statement admits of no exceptions, but physical conditions have in many instances influenced man, or have practically determined some things for him. The questions that follow not only explain the statement, but suggest themes on which to base research:

1. As Spain, and France were not destined to be one nation, could the boundary between them reasonably have been placed elsewhere?
2. If the racial characteristics of the peoples to the north and south of the Pyrenees are so different that union would be unwise, are the Pyrenees in the least responsible for the fact?
3. Would the Swedes and Norwegians have been justified in making an arbitrary boundary line between their countries?
4. What man was largely responsible for pushing Italy's boundary up to the Alps? Did he try to go farther?
5. Locate twenty natural boundary lines between the states of the American Union, and endeavor to find reasons from our history why in some cases arbitrary lines were chosen rather than natural.

Geography Presented by Outlines. In this subject as in every other, it must be kept in mind that successful results are reached only by proceeding from the known to the unknown. The child learns the geography of the yard around his home, without knowing that he has mastered the first elements of geographical science. He knows the direction of one object with respect to another and has an idea of relative distances. In play he may imagine the grass area a vast plain; the vines and bushes, trees and forests.

When he goes to school the geography of the schoolyard is to be learned, and if he is in the country, he is soon to know *as geography* the strip of land between home and school. In his geographical plays the brooks are dignified as rivers; the hills become mountains; stretched before him are valleys, plateaus, forests. Such is his introduction to the science of geography. When he is able fairly well to understand distance and elevation he can imagine the contour of a moun-

Wonder Questions in Geography

Do people on the side of the earth opposite us walk upside down?

Since our earth is a ball, the heads of people in Australia, for example, are pointing in exactly the opposite direction from those of people in the United States and Canada. But the Australians are in no more danger of flying off into space than the Americans are, for the law of gravitation operates universally. There are no ups and downs in the universe. No matter in what part of the earth a man may be, it always seems to him that the sky is overhead and the ground below. "Up" and "down" are terms used for convenience, but in the great scheme of the universe they have no significance except as they refer to the center of the earth.

What would be the result if the earth did not rotate on its axis?

Because of the earth's rotating motion some portion of our planet is being shut off from the sun's light all the time. That is, there are alternating periods of darkness and daylight for every portion of the globe. If the earth did not rotate the side facing the sun would have daylight the year round, and the other side would be in perpetual darkness.

Why are day and night of unequal length?

Because the earth's axis is inclined about 23° 30′ from a perpendicular to the plane of its orbit. If the axis were perpendicular an imaginary line separating the illuminated side of the earth from the dark side would pass directly through the poles. Exactly half of the northern hemisphere and half of the southern would always be in the light as the earth traveled around the sun, and day and night would always be of equal length in all parts of the globe. But because the earth is tipped and rotates diagonally, the portion of the northern hemisphere receiving light is greater than the portion in darkness, when the northern hemisphere is turned toward the sun, and the dark portion is greater than the light portion when that hemisphere is turned away from the sun. The same conditions are true for the southern hemisphere. Thus the periods of daylight and darkness are subject to considerable variation.

Why do people in the northern hemisphere have their coldest weather when the earth is nearest the sun?

This may sound improbable, but it is true. The path in which the earth travels around the sun is not exactly circular, and the distance of our planet from the sun therefore varies. It is during the northern winter that the earth comes nearest to the sun. However, the amount of heat which any section of the globe receives depends upon the angle at which the sun's rays strike it. The fact that the sun is nearer the planet at one time than another is not a determining factor, for the variation is not great enough to modify the effect of the rays. During the northern winter the sun's rays fall vertically at points south of the equator, while in the northern hemisphere the rays are very oblique. Direct rays give more heat than slant rays because they pass through less air and are spread over less surface. Thus the northern hemisphere has its coldest weather after the sun has reached the southern tropic.

Why doesn't the earth run away from its own atmosphere?

The atmosphere is an inseparable part of the earth's system, and travels with our planet on its endless journey around the sun. Though the earth revolves at the enormous rate of 66,000 miles an hour, there will never be any danger of its running away from the air.

How far does the atmosphere extend?

No one knows the thickness of the earth's atmospheric envelope, but many authorities estimate it to be between one hundred and two hundred miles. Half of its bulk, however, is within two and one-half miles of the earth's surface; beyond that point it becomes increasingly rare.

Are there mountains in the ocean?

Yes, Cuba and other islands of the West Indies are probably the tops of an oceanic range, and many volcanic and coral islands are peaks of submarine mountains. Sometimes the crests of mountains wholly under water are discovered by sounding operations. However, no mountain ranges like those on land have as yet been discovered on the open ocean bed far from the shores of continents.

What is known of conditions beneath the surface of the ocean?

In the upper parts of the open ocean there are numerous forms of animal life, ranging in size from whales to organisms invisible to the naked eye. Shallow waters nearer shore teem with both animal and plant life. Here are pastures of moss and gardens of seaweed. On the ocean floor far out at sea there are vast stretches of ooze, made of innumerable tiny shells more or less decomposed. These are the remains of minute one-celled animals that lived in past geologic ages. There are no plants on the deep ocean floors, because sunlight cannot penetrate to those depths, but various forms of animals, many of which are blind, exist there. The ocean between the upper layers and the lowest depths has been described as a cold, quiet, monotonous desert.

Could fish that live in the deepest parts of the ocean exist near the surface, and vice versa?

No, because the pressure at the bottom of the sea is enormously greater than that near the surface. Fish living at a depth of 32,000 feet, for example, are supporting a weight of nearly six tons upon every square inch of their bodies, and they are especially adapted to withstand this enormous weight. If they should swim into the upper layers of water they would burst. Shallow-water fish, on the other hand, would be crushed if they swam into lower depths.

How far is it from the top of the highest mountain to the lowest depth of the ocean?

Mount Everest, the loftiest peak in the world, is 29,002 feet high. The lowest ocean depth, so far as is known, is 32,088 feet below sea level (near the Philippine Islands). The distance between is 61,090 feet, or nearly twelve miles.

What is the cause of thunder and lightning?

Lightning is an electrical disturbance. Scientists tell us there are two kinds of electricity, positive and negative; also, that positive and negative charges mutually attract each other. Now when two clouds, or a cloud and the earth, oppositely charged, get so close together that there is an electrical discharge, a shower of sparks occurs. A flash of lightning is in reality a succession of sparks a very small fraction of a second apart. A flash comparatively near one appears as a zigzag line of brilliant light, which sometimes breaks into several branches. This is often called chain lightning. So-called sheet (or heat) lightning is the illumination in the sky of chain lightning which is itself not visible to the observer. Thunder is a result of the sudden expansion and compression of the heated air along the path of the flash. There is produced a partial vacuum along this line of discharge, and the violent inrush of air into the partial vacuum causes the sound. When the observer is about the same distance from each of the two surfaces between which the discharge takes place, a sudden crash is heard; if the observer is much nearer one end of the path of discharge than the other he hears a prolonged roll, for the sound reaches the ear from different parts of the path at different times. A rumbling roar is often produced by clouds that reflect and hills that echo the sound. As sound travels more slowly than light, the interval between a flash and the accompanying roar is often quite perceptible. When the flash is very near the two may seem to be simultaneous.

What causes the phenomenon known as the "sun drawing water"?

This interesting spectacle occurs when the sun shines through rifts in the clouds. Minute dust particles in the air reflect and scatter some of the light, and mark the passage of the rays.

Does it ever rain angleworms?

No, such a phenomenon has never taken place, though people sometimes believe that there are showers of worms. Everyone has seen the walks fairly well covered with worms after a spring rain, but the shower merely caused the creatures to emerge from their underground burrows.

How can it rain from a cloudless sky?

In this case the precipitation is light and covers only a small area. There is some moisture in the air and there are favorable conditions for its condensation into raindrops, but not enough drops are formed to make a visible cloud.

Is there another side to the rainbow?

No doubt you have often wondered if people on the other side of the rainbow can see it as well as you. When you remember that you always see the rainbow in that part of the sky which is opposite the sun, and view it always with the sun behind you, you will readily see that there is only one side to the rainbow. The rainbow is caused by reflection and refraction of the sun's rays as they fall on drops of rain; each drop acts as a tiny prism and breaks up the white light of the sun into the different colors that we see in the bow. But you can never see the arch of colors when you are facing the sun.

What causes the cracks and chasms in a glacier?

A glacier is a moving mass of ice, whose movements are much like those of a stream. That is, it moves faster at the surface than at the bottom, and more swiftly in the center than at the sides. Because of these differences of movement the ice mass is subjected to a strain that causes its surface to become seared with cracks and chasms, which are sometimes fifty or sixty feet deep. As the break is at right angles to the direction of the strain, the cracks frequently point upstream.

How were the mountains formed?

Nearly all of the mountains are gigantic wrinkles in the earth's crust. They are the result of some tremendous upheaval within the rock mass, which caused the earth's crust to fold or crumple in such a way that huge masses were uplifted. A few mountains are the result of erosion, or wearing away of land areas by wind, water, etc. Sometimes certain areas are so hard that they resist this wearing action, and when the surrounding land has been worn down they stand out alone and form mountains. Other mountains are formed by the eruption of great masses of igneous (heated) rock and other volcanic material. Sometimes there are eruptions of igneous rock that never reach the surface, but which form mountains by bulging up the crust above them.

What causes salt lakes to form? Could a salt lake ever become fresh?

Such lakes are salt because they have no outlets. The water that flows into a lake basin contains various mineral salts in solution. If there is an outlet, water and salt flow off together, but if there is no outlet the salt remains in the lake bed when evaporation takes place. In the course of time the water may become mere brine. Salt lakes have been known to become fresh, when, after a period of drought, the water has disappeared and left the mineral salts deposited on the lake bottom. After a time the salt deposit is covered with a layer of soil brought by the winds, and the lake basin eventually is filled with fresh water.

What is a ''lost river''?

These interesting rivers are streams which disappear beneath the surface in parts of their courses, and continue as underground rivers. Usually the stream gets "lost" by plunging into a sinkhole. Such rivers are common in limestone regions; one of the most notable flows along the floor of Mammoth Cave, Kentucky. Subterranean rivers in Southern California have been brought to the surface for irrigation purposes.

Of what is fog composed?

A fog is simply a cloud near the ground, and is therefore made of moisture which has condensed and become visible. If you should ascend a mountain whose upper slopes are wrapped in clouds you would eventually find yourself enveloped in a mist, and if you went on to the top where the sun had dispelled the mist you would look down upon the rolling clouds you had first viewed from below. People who live in large cities often suffer from aching throats on a foggy day. This is because the fog collects the ill-smelling gases and smoke common to the city air.

What is a mirage?

A mirage is a deceptive appearance frequently seen in deserts and other arid regions. The conditions that prevail in a desert are especially favorable to the formation of a mirage. Here the air near the surface of the ground often becomes very hot, and there is formed a sort of bounding surface between the lower and upper layers of air. The bounding surface acts like a reflecting mirror, in which objects appear as if upside down. A bit of sky may be reflected and seem to the distant observer to be a lake in the desert. Trees are sometimes thus reflected, and travelers, thinking they are seeing the trees imaged in water, form the conclusion that they are approaching an oasis.

What are the ''northern lights''?

The scientific name for this beautiful phenomenon of northern skies is aurora borealis. Years ago many people believed that the display was the reflection of sunlight shining on the icebergs in far northern regions. But scientists now believe that the aurora is caused by the passage of electricity through the upper atmosphere, where the air is very rare. The display is probably a form of electric discharge, similar to that produced by a frictional electrical machine. In appearance the aurora is a great arch made up of many streamers or rays of light, varying in color between crimson and pale green or yellow. The rays are constantly in motion and assume an endless variety of shapes.

Where do winds come from?

Wind is simply air in motion. Everyone has noticed that there is an upward current over a lamp chimney or an open fire. This is the result of heating and expansion of the air. The expanded air is less dense than the cooler air about it, and so is forced upward as the heavier, surrounding air pushes in. Something of this nature is taking place on a large scale in the atmospheric envelope of the earth. Winds are caused by changes of temperature. When, in any locality, the temperature of the air is raised to a point higher than that of the surrounding air, the heated air expands and is pushed upward by the heavier air which flows in. In the general scheme of circulation we find two great movements taking place: the heated air at the equator is rising and flowing toward the poles, and cooler surface currents are flowing toward the equator.

Why is it generally warmer at the autumn solstice (September 23), when the sun's rays shine vertically on the equator, than at the spring solstice (March 21), when the sun is exactly in the same position?

This question applies, of course, to the north temperate zone. Although the sun has the same postion in March as in September, in March the earth is still feeling the effects of three or four months of cold weather, while in September the accumulated warmth of the summer months modifies conditions. For the same reason August is a hotter month than June, though the sun reaches its farthest point north on June 22.

Where on the globe do travelers journeying eastward lose a day, and those journeying westward gain a day?

This occurs at the international date line, which is the 180th meridian. Because of the earth's curvature, sunrise, noon and sunset move continuously westward at the rate of fifteen degrees of longitude every hour. For instance, when it is 7:00 A. M. at New York City it is 4:00 A. M., or three hours earlier, at San Francisco. That is, the sun rises three hours earlier at New York than at San Francisco. The watch of a traveler going westward is therefore gaining time at the rate of one hour for every 900 miles. One going eastward find his watch losing at the same rate. It is apparent, then, that in a trip around the globe one would lose or gain an entire day. For convenience, the 180th meridian has been adopted as the international date line, and ships crossing this meridian drop a day from the reckoning, or add one to it, according to the direction of travel.

How can scientists foretell storms and other weather conditions?

Weather forecasting is done by scientific methods. The procedure of the United States Weather Bureau is typical. There are scattered throughout the country more than 200 observation stations. Every twelve hours the head of each station makes observations of the sky and clouds, reads the barometer to ascertain the pressure of the air, observes the direction and the velocity of the wind, measures the amount of rainfall or snowfall, calculates the amount of moisture in the air, and reads the thermometer. The result of his observations are then summarized, condensed into a cipher message of four or five words, and sent to the proper telegraphic circuit. The messages are all finally collected at the central office in Washington, and are also translated at various forecasting stations along the route. Twice a day the Washington office constructs a weather map showing conditions over the country, and by means of such maps forecasters predict conditions for their own localities and neighboring territory.

Why is snow white?

According to the accepted theory of color, white is a mixture of all the colors of the rainbow. Any object looks white which reflects all colors equally; an object looks red which reflects only the light wave that produces red and absorbs all the others. When vapor is condensed into snow crystals, the flakes have numerous tiny surfaces, each of which acts as a reflector and sends back to the retina of the eye practically all of the sunlight which strikes it. And because these tiny facets reflect all colors and absorb none, the snowflakes look white.

Could anyone make a correct flat map of any part of the earth?

No, such a map is an impossibility, because we cannot flatten out a curved surface without distorting it. Map makers succeed in getting their maps only approximately correct. Some sacrifice form and area accuracy to get the directions correct, some get areas correct but at the same time distort forms, and so on. By one plan of map making all points in the same longitude are in the same vertical line, but a map of the western hemisphere made on this plan shows North America much larger than South America. This is due to the fact that such a method exaggerates east and west distances near the poles, and as North America is broadest near the North Pole, it is all out of proportion on the map.

tainous country, the appearance of a great river, the vastness of the ocean. A great deal of foundation work may be thoroughly done through the medium of local geography, without passing the physical bounds named.

For the best development of a subject an outline is recommended. If the student wishes to study political geography, for example, he will wish to begin with the school district, the smallest political division, and advance to the township, the city, the county, the state, a country, and finally a continent. In these volumes under the various headings named will be found outlines on each of these divisions.

History. The ancients' ideas of the earth were very vague. By them it was generally considered flat or in the form of a shield surrounded by water and covered by the canopy of the sky. The Phœnicians were the first to extend geographical knowledge. It is supposed that they explored the coasts of the Mediterranean, and some believe that they made voyages as far south as the southern part of Africa. The Romans' idea of geography was confined to the Roman world, including the southern part of Europe, northern Africa and western Asia, and these boundaries of geographical knowledge were not materially extended until the Middle Ages. In the thirteenth and fourteenth centuries reports from travelers who had been as far as China and Japan gave the people of Europe some knowledge of that part of the world and prepared the way for the great era of exploration which began in the latter part of the fifteenth century. During this period new ideas concerning the form of the earth were advanced, the southern point of Africa was reached and a water route to India was found. The New World was also discovered. These discoveries led to unusual activity during the sixteenth century. The coasts of the New World, with the exception of those bordering upon the Arctic Ocean, were explored, and the earth was circumnavigated. Following this period of discovery, attention seems to have been given to conquest, and during the seventeenth and eighteenth centuries voyages of discovery were not so numerous. The nineteenth century is noted for the many expeditions into the interior of unknown continents and to the polar regions. By the close of that century Africa, Australia and all other remote lands had been explored, and the only large portions of the earth which had not been visited were those immediately surrounding the poles.

But the greatest advance in geography made during this period was in the organization of its facts in accordance with the principles and laws which governed them and the placing of geography on a true scientific basis. With the accomplishment of this work, views concerning the scope, purpose and value of geography greatly changed. Instead of being considered a knowledge of unrelated facts, it came to be known as a science, depending upon fundamental principles and laws, which were of more importance to the geographer than the mere facts concerning the size, form, inhabitants and other conditions of the earth's surface. The outgrowth of these ideas has led to the establishment of what is known as the *new geography,* which means geography as studied from a scientific point of view.

Related Articles. In the above subject-matter many related geographical titles are referred to. In addition, the reader will find thousands of others in these volumes. They are too numerous to record here, for fully one-sixth of the set of books is devoted to geography. See, also, titles listed under Physical Geography.

GEOGRAPHY, METHODS OF TEACHING. The purposes of geographical study should be:

(1) To give the pupil a knowledge of the most common facts of geography which are found in his immediate surroundings, such as the plants and animals living in his locality and the occupations with which he meets from day to day.

(2) To lead him to become familiar with the fundamental principles and laws of geography, such as those governing climate and the distribution of life.

(3) To lead him to apply these laws and principles in determining geographical conditions.

(4) To lead him to see how these conditions control human activities at the present and how they have affected these activities in the past.

Teacher's Preparation. In order to accomplish these ends, the teacher must be thoroughly prepared for her work. This preparation should include (*a*) a knowledge of the fundamental principles and laws of the science and ability to apply them to the conditions of her environment; (*b*) a knowledge of the great facts of geography, such as the climatic conditions of the different parts of the various continents, the effect of mountains upon climate and the characteristic animal and vegetable life of the different regions of the earth; (*c*) a knowledge of

Methods of Teaching Geography

- I. PURPOSES TO BE GAINED
  - (a) In primary and intermediate grades
    - (1) Knowledge of immediate surroundings
    - (2) Local plants and animals
    - (3) Occupations
    - (4) Elementary principles of political and mathematical geography
  - (b) In grammar grades
    - (1) Principles and laws of the science
      - (a) Distribution of animal life
      - (b) Distribution of vegetable life
      - (c) Laws governing climate, tides, seasons, etc.
      - (d) Political geography
  - (c) Application of general laws
    - (1) To special cases and places
    - (2) Exceptions due to local conditions
- II. PREPARATION OF TEACHER
  - (a) Knowledge of subject far beyond point class is expected to study
  - (b) Ability to reduce to simple language scientific data of physical geography
  - (c) Knowledge of general methods of teaching
  - (d) Study of geographical topics in the best teachers' journals
- III. AIDS IN TEACHER'S PREPARATION
  - (a) Knowledge of correlated subjects
  - (b) Reference works on topics of the day's lessons
  - (c) Careful reading of current publications
- IV. EQUIPMENT
  - (a) Globe and wall maps
  - (b) Indexed clipping file
  - (c) Modern text-books for class use
  - (d) Supplementary text-books for pupils' reference
- V. METHODS BY GRADES
  - (a) Primary grades
    - (1) Make local geography real
    - (2) Acquaint pupils with technical geographical names of local objects
    - (3) Use of maps
      - (a) Show relative distances and locations locally
      - (b) Make clear that a map is merely a picture on a small scale
  - (b) Intermediate grades
    - (1) Apply general facts from local geography to world conditions
    - (2) Model continents from sand, locating river systems, mountains, valleys, with care
    - (3) Study cities
      - (a) Size
      - (b) Reasons for location
      - (c) Causes contributing to growth
    - (4) Text-books
      - (a) Endeavor to visualize text, making descriptions seem real
      - (b) Basis of imaginary journeys
  - (c) Grammar grades
    - (1) Text-books should be used daily in connection with good reference works
    - (2) Compile clippings on geographical subjects
    - (3) Make maps from memory, drawn to scale
    - (4) Study of types

the more minute facts of her own country, state and town; (*d*) a knowledge of the principles of teaching.

This preparation can be obtained by the study of standard works on geography, the elementary works on the different branches of natural science, particularly physics, botany and zoölogy; the reading of books of travel and articles of a geographical nature which are found in newspapers and other periodicals. In addition to this the teacher should be a good observer, as by careful observation she will be able to verify in her own experience many of the facts gleaned in her reading.

The teacher should be provided with such material as will assist her in the presentation of the subject in such a manner as to make it both interesting and of practical value to her class. To this end she should make collections of pictures, catalogues and circulars of the great railway and steamship lines of the country. She should also collect and arrange a scrap-cabinet consisting of articles cut from newspapers and magazines and of references to articles in periodicals and books from which articles cannot be clipped. All this matter should be systematically arranged and catalogued. The most convenient and inexpensive plan is to place the pictures and clippings in large envelopes, either arranged alphabetically or by continent and country. For united study the latter plan is preferable, since according to such a plan all articles pertaining to the United States would be placed in the envelope headed *United States,* or if a special study were made of her own state the articles pertaining to that would be in an envelope by themselves. This applies also to pictures.

Primary Grades. The work in geography in the first three grades is preparatory to a systematic study of the subject in the grades which follow. In the first and second grades only the simplest geographical facts should be treated. The beginning of this work is in connection with nature study, the geographical element here consisting of calling attention to the localities in which the plants and animals studied are found (see NATURE STUDY). In connection with this the study of the weather is helpful and interesting. A good plan for this work is to construct a calendar upon the blackboard or upon a large sheet of manila paper. The calendar should be ornamented with a picture which expresses the prevailing weather of the month. If it is December and the locality is in a cool climate, this picture should show the ground covered with snow and, possibly, children engaged in winter sports. If there is room to make the calendar sufficiently large, it adds interest to this work to characterize the weather of each day by an outline picture, in which some leading event of the day will be brought out.

From the study of plants and animals, the class naturally passes to the study of the most common substances used for food, for clothing and, with the older classes, for building purposes.

The work of the second year should be a continuation of that of the first year; but as this work is expanded the geographical feature should be more strongly emphasized, and the pupils should be led to discover many geographical facts for themselves. This should be done largely by out-of-door excursions, by which pupils may come into personal contact with nature and its phenomena. The work in geography for the third year should be largely home geography. The pupils should study the various occupations in the town or near-by city and should be led to see the reason for each of these and something of their relation to one another. This naturally leads to the study of transportation, and the reasons for carrying commodities from one place to another should be discovered.

Map making should begin this year and should be of the simplest sort, consisting first of a map of the schoolroom, then of the school building and grounds. This line of work should be carefully planned and supervised by the teacher. The idea of scale should be thoroughly fixed in the minds of the pupils, and they should be led to see what a map is and what it represents. The ideas gained from travel can also be profitably introduced in this grade. Some pupils may have taken journeys to neighboring towns and cities and can relate something of what they saw. Imaginary journeys can also be taken, and suitable books of travel can be read by the pupils themselves or by the teacher, at stated times during the day or on a certain day in the week.

In developing the work of the second and third grades, special attention should be given to teaching the pupil fundamental geographical concepts, with their appropriate terms, such as bodies of water extending into the land (bays and gulfs), small bodies of water surrounded by land (pools and lakes), abrupt elevations of land (hills and mountains). This line of work should be extended to cover the fundamental facts of geography, giving the pupil the necessary vocabulary for expressing himself in proper terms when he takes up the formal study of the text-book.

In connection with this, pupils should be taught to read maps properly; that is, to place behind the map symbols the proper mental picture, so that an irregular line (river) shall not represent a mere mark upon paper, but flowing water, containing its appropriate aquatic life, bearing on its bosom the country's commerce and giving to the country through which it flows luxuriant verdure and productive soil.

Intermediate and Grammar Grades. Fourth grade classes usually begin the study of geography by the use of the text-book, and perhaps more failures in teaching this subject occur at this point than at any other. The reasons for these failures are that the pupils are not suitably prepared for the text-book and that the teacher does not become sufficiently familiar with the scope and plan of the work to introduce the pupils to it in such a way as to enable them to overcome the difficulties attending its use. The first requisite to the successful teaching of the text of a primary geography is a thorough understanding of the book on the part of the teacher; the second is a discovery of the geographical knowledge which the pupils possess. With these facts in mind the skilful teacher can so adjust the class to the book as to remove the difficulties usually met at this stage of the study.

Map making should be carried on during this year and should be extended to include sketches of the natural divisions studied and, in the latter part of the year of the countries. Maps drawn by the pupils should be as simple as possible and should never include more than the most important features. In the main, they should be sketched and the work should be rapidly done, but accuracy of form and proportions should be insisted upon.

The work in the grammar grades is simply a continuation of that begun in the fourth grade. The difficulties to be watched and overcome are those which occur in the transition from the primary to the advanced text-book. Many texts in geography used in the grammar grades begin with a discussion of the fundamental principles of mathematical geography. Such a discussion requires altogether too broad a generalization for pupils of this age and leads to confusion and discouragement and often to a thorough distaste for the subject. Books so arranged should not be strictly followed in plan. If this part of the work is to be taken at all, it should be considered after the other portions of the book have been completed and the pupils have reached a more mature stage.

Study of Types. One of the most successful plans of teaching geography is by leading the pupils to study types. There are so many facts in geography that only a few can be studied at best, and when some great topic is taken and understood, it becomes an illustration for all other objects of a similar nature, as a study of the Mississippi River leads the pupils to gain a general idea of all rivers. This is true of the study of all the great forms of land and water and of the leading industries. This method of presentation is successful, provided the teacher thoroughly prepares for the work and confines it to the capacity of the pupils. The danger is that too much will be attempted and that the type study will not be logically connected. With care to avoid these dangers, the study of types is one of the most valuable features connected with geography work.

The teacher will find valuable assistance in the following works: McMurry's Special Method in Geography; Redway's New Basis of Geography, and King's Methods and Aids in Geography. See, also, Methods of Teaching.

GEOLOGICAL, *je o loj'i kal,* **SURVEY OF THE UNITED STATES**, a bureau in the Department of the Interior which has oversight of mineral resources, studies geological structure and controls the irrigation of lands which are being opened for cultivation by the government. It was formed in 1879 by the combination of four independent surveys, which for a number of years had been engaged in explorations of the western part of the United States. The bureau is in charge of a director, who is required to submit an annual report of the work done by the Survey to the Secretary of the Interior. These reports are works of great value.

The most important duties with which the Survey is charged are the preparation of a topographical map of the United States, the examination of mineral deposits, the collection of mineral statistics, the study of the water supply of the country, with reference to the development of water power and irrigation of arid lands and the classification of public lands. The topographical map when completed will show the distribution of the rock formations of the country, their structure and the location of mineral deposits. As fast as completed, this map is issued in sections in folio form. For the purpose of carrying on its different lines of work, the Survey is divided into several sections, among which are those of mining and mineral resources, metalliferous ores, nonmetalliferous products and physical and chemical research. In addition to its annual reports, the bureau publishes numerous pamphlets, monographs and maps.

GEOLOGY, *je ol'o ji,* the science which treats of the origin and history of the earth. It is chiefly through the study of rocks that scientists have been able to read the earth's story, and consideration of this subject may well begin with the story of the rocks themselves.

How Rocks Were Formed. Whatever theory one may hold concerning the origin of the earth, there is every evidence that the rocks upon its surface have been formed in two ways—by the action of heat and by the action of water. Those formed by heat are known as *igneous rocks,* and they constitute the oldest and by far the largest part of the earth's crust. These rocks first existed in a molten condition and were solidified by cooling. Granite, gneiss and basalt are good illustrations of rocks of this class.

The rocks formed by water, generally known as *sedimentary rocks,* are found in the lowlands along the shores of bodies of water and on the margins of streams. The lowlands near the mouths of great rivers were also formed in this way. The rain falling upon the sides of the mountains washed loose particles of rock down to the lower levels, and they were carried along by streams, until the force of the current became so slight that the water would no longer hold them in suspension. These particles then settled at the bottom of the stream, forming mud. In the course of time the land was raised, and this mud hardened into rock. Because such rocks were usually formed in layers they are also called *stratified rocks.* In many places the flooding of the earth's crust caused the stratified rocks to be folded and tilted, so that they do not now occupy a horizontal position as they did when formed. For this reason, also, we find the igneous and stratified rocks intermingled in a confusing manner in many localities. The heat and pressure to which some of these formations were subjected have entirely changed their nature, and they are known as *metamorphic.*

Geologic Systems. The history of the rocks is determined almost entirely by studying the fossils which they contain.

Fossils are the remains of plant and animal life that lived in past geological ages. Since the lowest rock layers are the ones which were first formed, we know that the fossils found in them represent oldest forms of life.

Beginning, then, with the simplest fossils found in the oldest strata, the geologist traces the development of both vegetable and animal life from the remotest period of their existence to the present time, each period in the earth's history being characterized by the unusual development of some form of life (see FOSSIL). Because of this and of the peculiar grouping of the rocks at the time, geological history is divided into a number of eras, each of which includes several formations, known as rock systems. The time during which a certain formation developed is called a period, each era consisting of several periods. The eras and systems here given are those generally accepted by the leading geologists:

Eras	Systems
Cenozoic (recent life)	Present Glacial Pliocene Miocene Oligocene Eocene
Mesozoic (middle life)	Cretaceous Jurassic Triassic
Paleozoic (old life)	Permian Carboniferous Devonian Silurian Ordovician Cambrian
Proterozoic (earlier life)	Keweenawan Animikean Huronian
Archeozoic (ancient life)	Igneous Rocks Granite Slate Limestone

Description of Eras. The rock formations of the oldest era, the Archeozoic, are called *Archean.* No fossils have been found in the Archean rocks, but there are certain deposits which lead geologists to infer that life may have existed even at that remote age. In the Proterozoic Era were formed the famous iron ores of the Lake Superior region. In the rocks of this era a few fossils appear, showing that life did exist at that period of time. Nothing is known, however, of the nature of that life.

TYPE OF VEGETATION OF THE CARBONIFEROUS AGE

During the Paleozoic Time life became, gradually, very abundant. Only the fossils of sea plants and animals have been found in the first rock layers, and nothing can be said as to the existence of land life early in this era. No vertebrates of any sort, not even the simplest fishes existed; but there were sponges and starfish and mollusks, much like our clams or oysters, and worms. Later, in the Devonian Period, the fishes appeared, huge forms related to the sharks. Finally the land, too, began to have life on it; swarms of little insects appeared, and there were snails, scorpions and amphibians, the first land vertebrates. Fernlike plants of huge size became abundant. Perhaps the most interesting feature of Paleozoic Time was the Carboniferous Period. During this period the greatest coal beds of America and Europe were formed, and it is this fact which has given the period its name; for *Carboniferous* comes from *carbon*, the Latin name for *coal*. The great forests of the earth kept on all through the period, building up layers on layers of black pulpy material which to-day we call peat, and which finally hardened into coal (which see).

Mesozoic Time is called the Age of Reptiles, and when we read descriptions of the reptiles which lived in those times, we are glad that the period ended before the days of men. Of course reptiles were not the only forms of life; there were corals and mollusks, as there had been earlier, and modern fishes, such as the salmon and the perch and the herring; there were a few birds with feathers, some of them having teeth set in sockets; and there were a few species of mammals of the lowest orders, relatives of the kangaroo and opossum. But, first and last, there were reptiles, of all sizes and forms. There were reptiles ten or twelve feet in height, which stalked about on two feet; and there were reptiles that walked on all fours, and that had heads over two feet long. There were amphibious reptiles, living partly in water and partly on land, covered with scales like a fish; and there were flying reptiles, like gigantic bats, with a wing stretch of twenty-five feet. Some of the most terrible were the megalosaur, a lizard twenty-five or thirty feet long; the ichthyosaurus, which had a long head, a short neck, a thick body and a long tail, and which grew to be thirty feet long; and the plesiosaurus, which had a very long neck, a small head, and four limbs developed like paddles for swimming. Never since Mesozoic Times have there been reptiles in anything like the number in which they existed then.

Ichthyosaurus TYPES OF ANIMALS OF THE REPTILIAN AGE Plesiosaurus

The last period of time, the Cenozoic, is sometimes divided into two periods, called the Age of Mammals and the Age of Man. In the Age of Mammals all forms of life existed. It is not true that all the kinds of mammals and of birds that existed in the earliest part of the period now live; but many of the lower orders of animals still exist just as they did then. And gradually, with the progress of the years, appeared animals much like the modern hog and rhinoceros and hippopotamus. But it was not until during the Age of Man that all the forms of animal life as they exist to-day finally appeared. Nor are we to imagine that the process of change has stopped; species are still becoming exinct, through man, if not in other ways. The dodo, a strange bird somewhat like a chicken, but much larger, was living in the seventeenth century, but exists nowhere now. The aurochs of Europe is nearly extinct, and our own buffalo bids fair to disappear from the earth.

Origin of the Earth. The question of the earth's origin has never been satisfactorily answered, but there are two theories that have received favorable attention. The *nebular hypothesis,* worked out by La Place, was at one time accepted by many leading scientists. It supposes that the earth is a part of a system that originally was a great mass of nebulous (gaseous) matter. Under the influence of gravitation this mass tended to become globelike in form and to rotate. As it gradually contracted it threw off portions of its mass, and these became the planets. The central parent mass is the sun. Nearly all scientists of to-day reject this theory (see NEBULAR HYPOTHESIS), and some accept what is called the *planetesimal hypothesis.*

Planetesimal Hypothesis. This later theory supposes that the earth is a part of a nebula consisting of swarms of small bodies called planetesimals, moving in orbits about a common center. As these bodies revolved they came together and were welded by pressure and heat, forming groups that became the planets, satellites and planetoids. The central mass, as in the other theory, formed the sun. The earth, it is supposed, was originally a small mass of planetesimals which increased to its present size by capturing other planetesimals (see EARTH).

Until very recent years, scientists believed that the central part of the earth was molten. It is known that the temperature increases with every foot one descends below the surface, and it was figured that if this heat increased in proportion all the way in, the center must be so hot that it would be fluid. Now, however, scientists believe that while the conditions as to heat are about as they have always believed them to be, the pressure of the earth's crust is so great that the rocks at the center are in a solid condition. Pressure always raises the melting point, and the hottest fluid would be solidified under the weight of the earth's crust. There are molten spots, it is thought, only where the pressure is relieved, as where the crust is uplifted under mountain folds.

Present Changes. The geological forces which have been in operation during all the ages are still at work, and changes in the earth's crust constantly occur. The most important of the forces now effecting these changes are the heat from the sun, the action of water (see EROSION), the action of the atmosphere and the disintegration of rocks

Outline on Geology

- I. HISTORY
- II. THEORIES OF ORIGIN OF EARTH
- III. BRANCHES OF GEOLOGY
  - (a) Cosmical Geology
  - (b) Geognosy
  - (c) Dynamic Geology
  - (d) Structural Geology
  - (e) Physiographic Geology
  - (f) Stratigraphic Geology
  - (g) Paleontologic Geology
- IV. GEOLOGIC DIVISIONS OF TIME
  - (a) Archeozoic
    - (1) Oldest igneous rocks formed
    - (2) No fossils
  - (b) Proterozoic
    - (1) Formation of granites, marbles and slates
    - (2) Appearance of fossils
  - (c) Paleozoic
    - (1) Appearance of continents
    - (2) Formation of coal
    - (3) Age of fishes, insects, amphibians
  - (d) Mesozoic
    - (1) Formation of sandstone,
    - (2) Great variety of vegetation
    - (3) Great variety of animals
  - (e) Cenozoic
    - (1) Continents nearly as now
    - (2) Birds, mammals
    - (3) Snow, floods, ice
    - (4) Age of man
- V. GEOLOGIC PROCESSES
  - (a) Making of rocks
    - (1) Part plants and animals have played in rock-making
    - (2) Work of air and moisture
    - (3) Work of winds, water, ice, heat
      - (a) Through expansion and contraction
      - (b) Through fusion
      - (c) Metamorphism
  - (b) Making of valleys
  - (c) Making of hills and mountains

by animal and vegetable life. The action of these forces tends to wear away the mountains and hills and to fill up the valleys. Lakes are becoming more shallow, and many have been changed to dry land within the memory of men now living. The land around the lower courses of rivers is continually rising, as in the case of the Mississippi, and the elevation of the continents is slowly but surely changing, as is shown by the gradual sinking of the eastern coast of North America and of the southern coast of Europe.

Geology and Mythology. We say, sometimes, without realizing that we are using figures of speech, that a volcano breathes out smoke; that the waves are angry; that a mountain lifts its head among the clouds; that the wind whistles; that the clouds threaten. With us, they are only figures of speech, but in the early days such expressions were more than that. The ancient Greeks and Romans lived in a region whose geological features could not be overlooked. It was no flat prairie country, the same to the north as to the south. There were mountains and mountain streams; there were volcanoes and earthquakes; there were chasms and rivers and deep still lakes and the restless, wind-tossed sea. And for all of those things the active minds of the Greeks and Romans had to find explanations. To those ancient peoples everything was alive, not with merely human life, but with the life of gods. A man might blow a basin of water and make little waves upon it; what, then, more natural than that the wind, so like, on a large scale, the blowing-out of a man's breath, should be the breath of some great god?

So they accounted for all the facts in nature which they saw about them. If they rose in the morning and found that the sea had become very stormy during the night and was hurling its great waves up on the shore, they felt that the sea god was angry, and they made offerings to him to buy back his favor. Anything so unusual as an earthquake or a volcanic eruption needed a very special explanation, so they invented histories that reached far back into the past, telling how the gods became angry with some huge giant and buried him under a mountain. His breath was the smoke of the volcano; his struggles to escape caused the earthquakes. A deep chasm or hole in the ground showed where some god had struck his spear, either in anger or because he wanted to get to the regions below the earth without taking a long way round.

Beginnings of a Science. Now, while such reasons satisfied for a time, it was natural that there should arise wise men who should ask some other explanation for the facts and changes they saw about them. How, for example, did sea-shells come to be imbedded in land scores of miles from the sea? What were the strange objects, some so like plants, some like animals, but all made of stone, which were found in the rock? What, if you found you could not believe that earthquakes and volcanoes were due to the twisting and struggling of a giant under a mountain, did cause those disturbances? Aristotle, away back in the fourth century B. C., wrote a book called *Meteroics,* in which he tried to prove that earthquakes and volcanoes were due to wind inside of the earth. He also declared, with a modernness which rather surprises us, that the land and the water are not just as they have always been; that some of what is now land was once covered with water, and may be again; while land may emerge from what is now the sea. Thus little by little the very beginnings of the science of geology were built up in ancient times.

Geology in the Middle Ages. During the Middle Ages little attention was paid to geology, but after the beginning of modern times, when men began to have a new interest in all the sciences, it came in for its share of study. But just as geology and religion had been mixed up in the ancient days, religion again began to have a connection with the growing science. Geologists declared that it must have taken ages and ages for the rocks to be formed by water; the doctrines of the Church declared that the world had existed for only about six thousand years. And straightway began a struggle between the scientists and the churchmen, the latter insisting that the geologists were attempting to overthrow the Bible. The battle was a long and fierce one; in fact, it is only in recent years that people have come to see that the geologists' statement that the earth has been in existence for a great, great length of times does not deny in any degree the truth of the Bible.

Related Articles. Consult the following titles for additional information:

Algonkian System
Archean System
Basalt

Cambrian Period
Carboniferous Period
Cenozoic Era

Wonder Questions in Geology

How old is the earth?

The age of the earth cannot be given with any degree of exactness, but all geologists agree that it must be reckoned in millions of years, and is probably not less than 100,000,000 years. The earth's story is read chiefly through the study of rocks, and the oldest rocks are known certainly to have been deposited millions of years ago.

What do fossils tell us about the development of plant and animal life?

Fossils are the remains of plants and animals that have turned to stone. They are found embedded in rocks, and they supply some of the best arguments for the theory of evolution. The simplest fossils are found in rocks deposited when the earth was very young, and they show that both plants and animals began as rudimentary organisms. As we read the successive layers of rocks we find the fossils of higher organisms appearing in regular order, until the most completely developed forms appear. We know also from the study of fossils that many forms of life reached a high stage of development, degenerated, and then became extinct. In past geologic ages both plants and animals flourished that would seem of incredible size if they should reappear to-day.

Does coal belong to the mineral or to the vegetable kingdom?

Coal is a mineral, but it is formed through the agency of plant life. Ages before man lived on earth portions of it were covered with dense growths of vegetation. In the course of time these vast forests became covered with water, and for long years they lay buried beneath the ocean's mud. Then the land rose again, and the mud hardened into rock. Upon the surface of this rock soil accumulated, and another growth of vegetation flourished in this soil. The second growth in time sank below the water and was covered, and the heat and pressure attending these changes converted the vegetation into coal. As this process was repeated many times, different veins of this fuel, separated by layers of rock, were formed. Anthracite, or hard coal, probably represents the oldest of such formations.

If all the continents could be leveled off and the material dumped into the seas, would we have a perfectly smooth globe and the present sea level?

Because the ocean basins exceed the continental areas in extent, and the average depth of the sea is much greater than the average height of land, there is not enough land material to fill those basins. Therefore if the continents were cut down and everything brought to a common level, this level would be about 9,000 feet below the present level of the sea.

Could the North American continent be worn down to sea level?

At all times there are forces in operation tending to wear away the land. These forces are chiefly the rivers, the atmosphere and winds. As a matter of fact, North America is being worn down at the rate of one foot in 9,000 years, and if there were no opposing forces, and this rate continued, the continent would be leveled in about 18,000,000 years. On the other hand, the present rate could not be maintained, for after a long time the forces that tend to level down would become weaker. Streams, for example, would become sluggish and would work less rapidly. There is always a possibility, too, that portions of the continent will be subject to uplift. Thus, though the continent is being worn away, the process will continue indefinitely.

Does the ocean contain volcanoes?

Yes, volcanic action occurs in the sea as well as on land, but we never see volcanic eruptions that take place far below the surface. At the places where such eruptions occur great mounds that may become mountains are built up, and sometimes the tops of these mountains project above sea level and form islands. Much of the sediment found on the sea floor has been furnished by volcanoes.

Is the landscape of the ocean floor as attractive as that of the continents?

There is no comparison between them, for by contrast with the diversified contour of the land the scenery of the ocean is overwhelmingly monotonous. There are, to be sure, elevations and depressions on the ocean bed, but a large part of the sea floor is nearly flat. The reason for this is that the most prominent forces acting on the ocean floor are those which tend to fill up the depressions and thus level off the irregularities. On land, however, forces of erosion tend to make the landscape very diversified.

How do sand dunes move from one place to another?

Sand is easily picked up and carried by the wind, and it sometimes happens that a dune actually moves from one place to another by the removal of sand particles from its windward to its leeward side. Such a dune may be made up to a large extent of the same sand throughout its travels. Dunes sometimes travel into forest areas and bury and kill trees. There are orchards on the New Jersey coast which have been almost completely buried within the lifetime of their possessors. Sometimes dunes that have submerged trees and other objects move on again and restore to view the buried features of the landscape. As vegetation tends to hold sand down, a wandering dune can be checked by letting plants get a hold in the sand.

What were some of the effects of the great ice sheets that once covered part of the earth?

It is probable that these ice sheets, several million square miles in extent, destroyed a great deal of life, and that life is less abundant to-day as a result. The movement of the ice also caused life to migrate. That is, as each great sheet moved forward the plant and animal life in front of its advance had to move on or perish. When the ice retreated these plants and animals found their way back again. The presence of Arctic animals in some of the higher parts of the Appalachian Mountains is an interesting survival of the period when life had to adjust itself to abnormal conditions. The great ice sheets changed the contour of the land considerably. Hills were leveled, lake beds were filled up and scooped out, and masses of rock and gravel were carried along and deposited as drift.

Are lakes permanent bodies of water?

The tendency for all lakes is to disappear in the course of ages, but the process is, of course, slow. The waves beat on the shores, wear off sand, gravel, etc., and deposit this material into the lake bed. Rivers flowing into lakes bear great quantities of sediment and deposit it. Sand and dust are blown into the water continually. The various animals that live in lake waters contribute their portion of deposit through their bones and shells. Dead plant life adds to the accumulation. Lakes with outlets have their level constantly reduced by the unceasing outflow. All of these factors outweigh those tending to keep the water undiminished, and so it can truthfully be said that the life of every lake is doomed. In fact, there are to-day basins of numerous extinct lakes, and there are many other lakes in their last stages.

Is there ground for believing that the earth will some day be a dead planet like the moon?

This prophecy used to be heard frequently when scientists believed that the earth had a molten interior and was slowly cooling off. A brighter view is taken by most modern geologists. The newest theory of the origin of the earth is that it developed from a gaseous nucleus which gradually solidified by capturing small solid bodies called planetesimals. The central mass grew slowly to the present size of the earth by the capture of other planetesimals, and so the earth was never, as used to be supposed, a hot, glowing body. The heat of the interior, according to geologists who advance this theory, developed largely through pressure. The tendency is to predict a long period of human activity and a much higher evolution spiritually and intellectually.

How were the oceans formed?

If the earth grew by the accumulation of planetesimals, its surface was probably never smooth, but had many depressions. In the course of time the atmosphere of the young earth began to hold water vapor, among other gases, and ultimately the vapor condensed and formed water. This water, accumulating on the surface of the earth, filled its depressions, and so made the beginning of the oceans. We must remember that this is but a theory. No one can say positively how the oceans came to be.

In what sense is man a geologic agent?

With the advance of civilization man has greatly modified the earth's surface. A savage race could live for centuries in a land and its chief features would be undisturbed. But civilized man removes forests, levels down hills, makes artificial lakes, turns rivers from their courses, fills in portions of lake shores, and otherwise changes the landscape to suit his own purposes.

Why do governments organize geologic surveys?

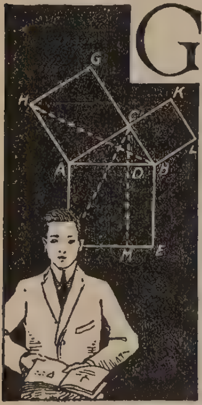
The products of geology are some of the world's most valuable economic products. For example, building stones, coal, natural gas, petroleum, precious metals, salt, fertilizers and many other products come within the field of the geologist. It is therefore a matter of great importance for a nation to survey and classify its geological resources.

Chalk
Clay
Coal
Conglomerate
Cretaceous System
Crystalline Rocks
Devonian Period
Dip
Dolomite
Earth
Eocene Period
Erosion
Fault
Flint
Fossil
Geological Survey
Glacial Period
Gneiss
Granite
Graphite
Gypsum
Hornblende
Igneous Rocks
Jurassic Period
Limestone
Marble
Mesozoic Era
Metamorphic Rocks
Metamorphism
Minerals and Mineralogy
Miocene Period
Moraine
New Red Sandstone
Obsidian
Old Red Sandstone
Ordovician Period
Paleozoic Era
Pliocene Period
Proterozoic Era
Quarternary Period
Ripple Marks
Rock
Sand
Sandstone
Shale
Silurian Period
Slate
Soil
Stratified Rocks
Tertiary Period
Trenton Series
Triassic System
Tripoli
Vein

GEOLOGISTS

Bell, Robert
Dana, James Dwight
Dawson, George Mercer
Dawson, Sir John William
Geikie, Achibald, Sir
Heilprin, Angelo
Le Conte, Joseph
Lyell, Charles, Sir
Muir, John
Powell, John Wesley
Shaler, Nathaniel S.
Tyndall, John
Van Hise, Charles Richard

Also numerous articles listed under Physical Geography.



GEOM'ETRY, that branch of mathematics which treats of the properties and relations of surfaces, volumes, angles and lines. It is a high-school and college subject. The most elementary study of geometry is not attempted usually, until the student has a good working knowledge of algebra.

A *solid* (more correctly termed a *volume*) is a portion of space bounded on all sides, and having three dimensions, length, breadth and thickness. A *surface* has only breadth and length. It may be considered as the boundary between a solid and all surrounding space or between two unbounded portions of space. A *line* may be considered either as the boundary between two portions of a surface or as an element having indefinite extension in one direction, that is, having but one dimension, length. A *point* is described as that element which has but position, lacking length, breadth and thickness. An *angle* is a portion of space lying between two lines which meet at a point, or between plane surfaces meeting at a point.

Geometry is divided into two great classes, *elementary geometry,* which includes *plane geometry* and *solid geometry,* that is, the study of the properties of planes, lines, angles and of the simple solids; and *higher geometry,* including *analytical geometry, descriptive geometry* and *projective geometry.* Descriptive and projective geometry deal with the various relations of forms of geometric bodies, according to a special method, by which figures corresponding to certain points in the body are represented on two perpendicular planes, the relations of the various points composing the body being studied by comparing these two figures.

Methods. The methods of geometry differ in important respects from those used in any other branch of mathematics. Geometry reasons about absolutely abstract relations and constructs theories and systems which can have no possible concrete existence.

Two methods of reasoning in geometry may be distinguished, known, respectively, as *direct* and *indirect.* The former starts from certain self-evident or incontrovertible facts and proceeds step by step to a conclusion, which, provided every step is in accord with pure reason, must be equally self-evident or incontrovertible. The indirect method begins with a supposition which may or may not be true, but which, for the sake of investigation, is assumed to be true. Upon this as a basis, a system using only known truths and demonstrated propositions is built up to a conclusion. If this conclusion accords with some known principle, the original supposition is shown to be sound. If the conclusion evidently disagrees with some known principle, the original supposition is clearly shown to be false. In the latter case the demonstration is said to be *reductio ad absurdum* (a reduction to an absurdity).

Axioms. All geometrical reasoning, whether direct or indirect, depends upon certain fundamental propositions, or axioms, among which may be mentioned the following, established by Euclid as a basis for his *Elements:* (1) Right angles are equal; (2) geometric figures can be moved in space without change of shape or size; (3) magnitudes which coincide with each other are equal; (4) the whole is greater than any of its parts; (5) two straight lines cannot enclose a space. Besides these he assumed a series of so-called postulates, or self-evident theorems, among which are (1) a straight line can be drawn between any two points; (2) a straight line can be produced to any length; (3) a circle may be described from any center to any distance from that center. These propositions and a few others which have been added from time to time by modern mathematicians are still the foundation of reasoning in geometry.

History. The science of geometry probably began with the Egyptians, but received its first important impetus from Greek mathematicians, among whom were Thales and Pythagoras, who studied triangles and circles, and Plato, who introduced the analytic method of investigation. Then came Euclid, known as the "father of geometry," who not only organized all the facts evolved by his predecessors, but added many new theorems. Of his followers, Archimedes and Apollonius were especially important. After the seventh century A. D. a period of stagnation in mathematical science set in, which was not ended until the sixteenth century, when the work of great mathematicians led to the application of more general methods of study and demonstration in geometry and especially to the introduction of algebraic formulas. Then followed Descartes, who extended the application of algebraic methods and laid the foundations of modern calculus. Little further progress was made until the nineteenth century, when branches known as descriptive geometry and projective geometry were differentiated from the original subject.

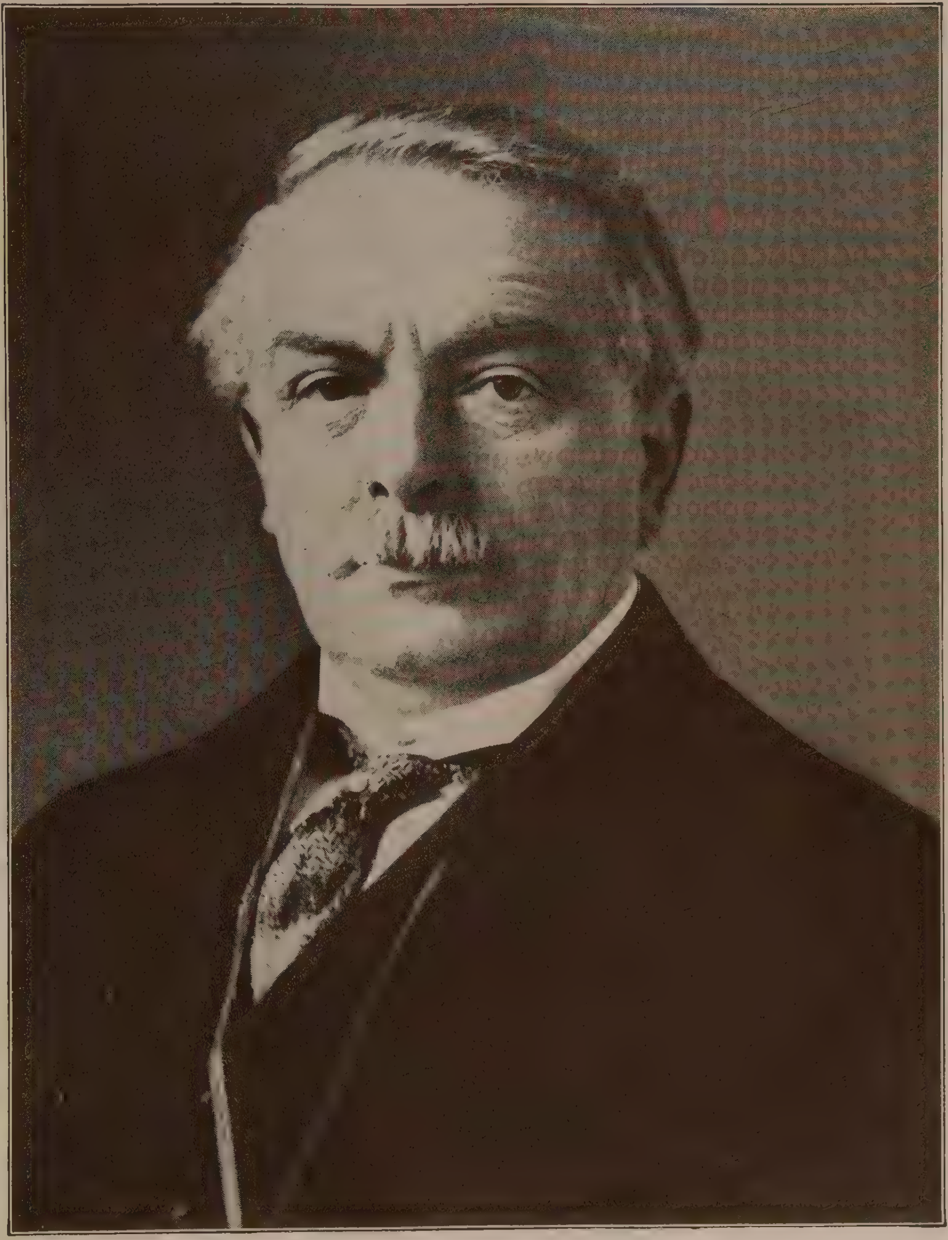
GEORGE, DAVID LLOYD (1863–), a British statesman who became Premier of Great Britain during the most critical period in modern English history. He was the first Britisher from the middle classes to attain that office, and his appointment, occurring in the midst of the World War, was in recognition of the fact that England needed at the head of affairs its strongest statesman. He was born in Manchester, where his father, a Welch schoolmaster named William George, was living in poverty. Left fatherless at the age of two, David was sent by his mother to Wales, and was there brought up by an uncle, a Baptist shoemaker. In his boyhood he took his mother's family name as a middle name and thereafter always called himself Lloyd George. Always a fighter, he became known while in his youth for his fiery insistence on the disestablishment of the English Church in Wales; by the time he was twenty-seven he had won a favorable reputation as a lawyer and had been sent to Parliament by the Liberals (1890).

For ten years nothing unusual was heard of him, and then came the Boer War. Lloyd George was one of the few Liberals who openly opposed that war, and this he did with a zeal that made him the most unpopular man in England. Later his point of view was given just consideration, and respect for his honesty, fearlessness and independence increased.

His first Cabinet position, that of President of the Board of Trade in Campbell-Bannerman's Ministry, was tendered him in 1906. Two years later he became Chancellor of the Exchequer in the Cabinet of Herbert Asquith, and for five years he and that great Liberal were identified with the most advanced movements that had ever been agitated in England. After disposing of the old-age pension bill, Lloyd George introduced, in 1909, a radical budget providing for great social reforms. Then ensued a bitter struggle between the Lords and Commons, as a result of which the titled House lost its absolute power of veto. That England to-day is ruled by the House of Commons is due directly to the fighting Welshman.

Other reforms followed, and in 1913 came a proposal to equalize land rights. Before this movement was fully on its way the World War broke out, and internal reforms had to be postponed. Lloyd George was made Minister of Munitions in May, 1915, in the coalition Cabinet, and he not only organized his department, which was newly created, but he made it so efficient that the announced program of the War Department was multiplied by sixteen. In June, 1916, he succeeded Lord Kitchener as head of the War Department, and in December of that year, on the resignation of the Asquith Cabinet, he was appointed Premier.

As head of the government Lloyd George had many difficult situations to face. When no favorable decision in the war was reached he was subjected to bitter criticism, from pacifist and military factions alike. Every crisis, however, he faced with decision and courage, and at the same time encouraged many notable reform measures, including extension of the franchise to women and an educational bill making the school system



DAVID LLOYD GEORGE

Prime Minister of Great Britain from 1916 to 1922. The "Fighting Welshman" is living proof that ability and grit will gain any man anything. This man, rising out of poverty, became by the end of the great war, the most outstanding figure in World affairs. Read the very interesting story of his life.

GEORGE V

more democratic. A great munitions strike in 1918 he settled by threatening to induct all strikers into military service. He won a signal victory in the House of Commons in connection with the appointment of General Foch as generalissimo of the allied forces, when he asked for and received a vote of confidence on the question of unified military control. In the general Parliamentary election of December, 1918, the coalition government of Lloyd George won an overwhelming victory, and in January, 1919, he again assumed the duties of Prime Minister. In October, 1922, following criticism of his foreign policy, especially in the Near East, he resigned, and the king appointed Andrew Bonar Law to succeed him as Premier.

GEORGE, Lake, one of the most beautiful lakes of the United States, situated in New York, south of Lake Champlain, with which it is connected. It lies at the foothills of the Adirondack Mountains, has numerous small islands, very clear water, and is a popular summer resort. The lake is about thirty-three miles long; its greatest width is three miles. The name was given in honor of King George III, in 1775. The site of the Battle of Lake George, fought by French and Indians on September 8, 1755, is now included in Battle Park Reservation, a state park.

GEORGE I (George Louis) (1660–1727), king of Great Britain and Ireland and elector of Hanover, was, through his mother, the great-grandson of James I of England. He was the first of the German Georges to rule over the English, and he could not speak the language of his subjects. In 1682 he was married to Sophia Dorothea of Zell, whom, in 1694, he divorced. In 1698 he succeeded his father as elector. He commanded in the imperial army during the War of the Spanish Succession and won considerable distinction for his bravery. In 1701 he was declared heir to the British crown, and he ascended the throne on the death of Queen Anne in 1714. George I was very unpopular with his British subjects, by reason of his lack of sympathy with England's traditions and ideals.

GEORGE II (George Augustus) (1683–1760), king of great Britain and Ireland and elector of Hanover, the son of George I. He married an intelligent German princess in 1705. In 1727 he succeeded his father on the English throne but inherited to the full his father's predilection for Hanover and dislike of the English. For over thirty years this member of a German house held sway over imperial England. The Seven Years' War, during which occurred the conquest of Canada, and the exploits of Clive in India, which furthered the growth of the British Empire there, are among the chief events of his reign.

GEORGE III (1738–1820), king of Great Britain and Ireland, succeeded his grandfather, George II, in 1760. In the following year he married Princess Charlotte Sophia of Mecklenburg-Strelitz. The young prince was the first of the Georges to be given an English education, and this made him more popular than his predecessors had been. The sixty years of his reign were filled with great events, among which were the Wilkes controversy; the American Revolution; the French Revolution; the Napoleonic wars, which followed, and the Irish Rebellion of 1798. In 1810 the king's mind, which had already given way several times, finally broke down, and from that time to his death his son, later George IV, governed as regent.

GEORGE IV (George Augustus Frederick) (1762–1830), king of Great Britain and Ireland, son of George III and the princess Charlotte of Mecklenburg-Strelitz. In 1811 George became regent on account of his father's insanity, and, on the death of George III in 1820, he became king. The most important event after his attaining the throne was the passing of the Catholic Emancipation act, by the Wellington ministry in 1829. He left no descendants and was succeeded by his brother, William IV.

GEORGE V, George Frederick Ernest Albert (1865–), king of the United Kingdom of Great Britain and Ireland, and emperor of India, the second son of Edward VII, was born at Marlborough House, London, June 3, 1865. It was not then considered likely that he would become the ruler of the empire, for he had an elder brother, Albert, Duke of Clarence. At the age of twelve, with his elder brother, he entered the navy as a cadet. Here for two years the princes were subject to the same discipline and drill as their shipmates with whom they messed. In 1879 they began their first long voyage. The following year Prince George was promoted to midshipman. This was but a beginning in the prince's advancement in his naval career.

In 1884 he became sub-lieutenant and the following year full lieutenant. In 1889 he was given command of a torpedo boat during the naval maneuvers. In 1890 he visited Canada and the West Indies.

In 1892 Albert, Duke of Clarence, died and George became heir-apparent to the throne. As the direct heir he became Duke of Cornwall and of York. The following year he married Princess May of Teck, the ceremony taking place in the Chapel Royal, St. James, July 6. Six children were born to the royal couple—Prince Edward Albert, born 1894; Prince Albert Frederick, born 1895; Princess Victoria Alexandra, called Princess Mary, born 1897; Prince Henry William, born 1900; Prince George Edward, born 1902, and Prince John Charles (1905–1919).

In March, 1901, the Duke and Duchess of Cornwall and York began a journey around the world in the battleship *Ophir*, which had been luxuriously fitted out for their comfort. The prince and princess reached Australia in season to participate in the events connected with the opening of the first Parliament of the Commonwealth. New Zealand and Tasmania were also visited. The next objective point was South Africa, and from there the journey was continued to India and thence to Canada by way of the Pacific. At this time the prince spent more than a month in the Dominion and made a study of Canada's resources and possibilities. The prince was again in the Dominion in 1908 as the king's representative at the Quebec Tercentenary.

On the death of Edward VII, May 6, 1910, Prince George was proclaimed king as George V. The new king had excellent training for his position. His years in the navy gave him an acquaintance with foreign countries and when his father ascended the throne he imposed many duties upon the Prince of Wales, who was a daily visitor at Buckingham Palace, where, during the transaction of business, he occupied a room adjacent to that of the king, with open doors between them. Moreover, he was frequently called in consultation with the king and his ministers. By these means he became familiar with the affairs of the empire and the duties of the sovereign. When George V became king, therefore, he was well prepared to assume the duties of his great office. He was first cousin to Czar Nicholas of Russia and of William II of Germany. He lost none of his popularity during the World War.

GEORGE I (1845–1913), king of Greece, second son of Christian IX of Denmark. In 1863 he was elected king by the Greek National Assembly. In 1867 he married the Princess Olga, a niece of the Russian Czar. His conduct as a constitutional monarch was always wise and firm, and he won popular sympathy by his efforts to expand Greek territory. At the close of the Balkan wars in 1913, which left his country victorious, he was assassinated at Salonika. His successor was his son Constantine, whose abdication was forced by the allies during the World War.

GEORGE, HENRY (1839–1896), an American political economist, born in Philadelphia. He went to California when a boy, found employment as a printer and became eventually an editor. In 1879 he published *Progress and Poverty*, in which he promulgated the "single tax" theory (see SINGLE TAX). His works include various treatises upon the land question, the *Science of Political Economy* and *Protection or Free Trade.*

GEORGE, SAINT (?–303), the patron saint of England, of whose life little is known. Legend says he was born in Palestine and educated at Cappadocia, and that he suffered martyrdom there. He was held in reverence by the English crusaders and was adopted as the tutelary saint of England in the time of Edward III. He also became the patron saint of Russia and Portugal. The red cross of Saint George on a white ground, formerly worn by all the English soldiery, now survives in the Union Jack. The legend of Saint George's combat with the Dragon was probably an invention of the Middle Ages.

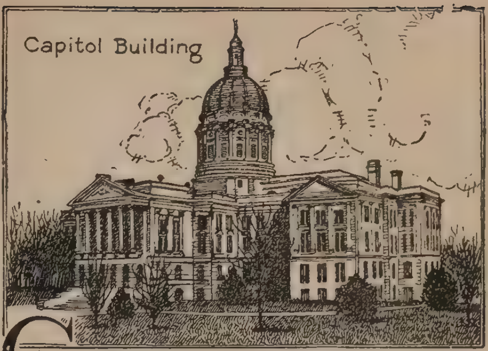
GEORGE ELIOT. See ELIOT, GEORGE.

GEORGE JUNIOR REPUBLIC, a community of boys and girls, organized near Freeville, N. Y., in 1895, by William R. George of New York. Its founder wished to give to neglected and unfortunate children the training which would equip them for performing the duties of citizenship and for earning an honest living. The community is a republic in form, governed by a constitution similar to that of the United States. Its officers are elective, and no office is now filled by an adult, the only limitation upon the powers of the youthful citizens being a veto power retained by the trustees. Children from twelve to eighteen years are admitted to the republic, and all members under sixteen must attend its schools. Training is given in profitable occupations, as farming, carpentry, printing, domestic science; and the equipment includes schools, hotels, stores, a bank, a library and numerous workshops.

Junior republics of a similar nature were founded elsewhere, and in time there was formed a National Association of Junior Republics. Because of persistent criticism of Mr. George's methods, the New York community was investigated by the State Board of Charities, and in 1914 it was decided to close the institution. Several men then pledged a new endowment fund, and Mr. George again took charge of the enterprise.

GEORGETOWN, the capital of British Guiana, near the mouth of the Demerara River. It is well built, has broad streets at right angles, with canals in the middle, and lofty wooden houses, often with luxuriant gardens attached. The harbor is suitable for sheltering a considerable commerce, in which the chief exports are sugar, rum and coffee. The climate is unhealthful, owing to the surrounding swamps. Population, 1911, 54,723.

GEORGE WASHINGTON UNIVERSITY, The, located in Washington, D. C., was originally chartered in 1821 as the Columbian College in the District of Columbia. By act of Congress, the name was changed to the Columbian University in 1873, and by an act passed in 1904 it became the George Washington University. Under this act the university was made nonsectarian and given power to organize colleges for carrying on educational work in arts, sciences and liberal and technical knowledge. The university comprises the Faculty of Graduate Studies, the Columbian College (for undergraduates), the Washington College of Engineering, the Division of Architecture, the Faculty of Medicine, the Faculty of Dentistry, the Department of Law and Jurisprudence, the Department of Politics and Diplomacy and the National College of Pharmacy. The institution is maintained chiefly by tuition fees and by voluntary gifts. There is a student enrollment of over 4,000 and a faculty of about 290. Students of this university have access to all the collections in the government laboratories, libraries and museums.



GEORGIA, *jawr′gi a*, one of the great commonwealths of the Southern United States, its importance being suggested by its popular name, EMPIRE STATE OF THE SOUTH. It touches the Atlantic Ocean between South Carolina and Florida, and has one great ocean port, Savannah. The area of the state is 59,265 square miles, which is over 10,000 miles greater than that of New York, the original "Empire State." Georgia ranks twentieth in size among the states. In 1910 it contained 1,431,802 white people and 1,176,987 negroes, a total of 2,608,789. According to the Federal census the population had increased to 2,893,601 by Jan. 1, 1920. The state ranks tenth in population among all the states.

Cities. In 1920, according to the census report, there were eleven cities with populations exceeding 10,000. The first five, in order of size, are Atlanta, the capital (200,606); Savannah (83,252); Augusta (52,548); Macon (52,995), and Columbus (31,125).

People and Education. In no other state is there so great a number of negroes, although the number in proportion to the entire population is greater in Mississippi. In Alabama the whites exceed the negro population by 254,915; in Mississippi there are 223,376 more negroes than white people. The illiteracy of the Georgians is 20.7 per cent, but this is due to the great number of black people; illiteracy among the white population is only 7 per cent. Conditions are rapidly improving, for there are now two-thirds as many colored children as white in the public schools.

The public school system is under the general direction of a state school commissioner and a state board of education. There is a school fund of nearly $2,000,000 raised yearly by local taxation, and a state appropriation of $2,500,000 or more. In all of the larger cities and towns, graded schools for both colored and white pupils are established, and high schools are liberally supported in all the larger centers. General interest is taken in education, and the schools throughout the state are being brought to a higher degree of excellence from year to year.

The University of Georgia is at the head of the school system. As part of the university are the technological school at Atlanta, the North Georgia Agricultural College at Dahlonega, the State Normal School at Athens, the State Industrial College for colored youth at College, and the Georgia Normal and Industrial College at Milledgeville. There are also numerous secondary schools and colleges throughout the state for both white and colored students, supported by religious denominations.

Surface and Drainage. A triangular section in the northern part of the state having an area of about 6,000 square miles is crossed by the Blue Ridge, the Cohutta, Taylor's Ridge and other ranges of mountains, which extend in a northeast-southwest direction. All of this section has an altitude of 1,000 or more feet, but there are no high peaks among the mountains, the highest not reaching 6,000 feet. Lookout Mountain, famous for its scenery and for famous battles of the Civil War, is partly in Georgia and partly in Tennessee. This entire region is interspersed with hills and valleys, and is noted for the beauty of its scenery. In the extreme northwestern part of the state is located Chickamauga National Park, which is surrounded by hills and low mountains. To the southwest of the mountain region are the foothills, which extend for about sixty-five miles and form a section of country diversified by low hills and broad valleys. This is a portion of the Piedmont region, which extends southward through the Carolinas. To the south and east of the Piedmont is the coastal plain, which occupies fully one-third of the state. The surface of this region is low and level. Off the coast are a number of large islands, with low surface and fertile soil.

Along the Fall Line, where the Piedmont region descends to the coastal plain, are rapids or falls in most of the streams; the location of such towns as Augusta, Milledgeville, Macon and Columbus is accounted for largely by this fact, since the fall of the rivers furnishes excellent water power.

Georgia's drainage system comprises the whole or part of nine river basins, and the state contains an unusual number of large rivers. The extreme northwestern part is drained into the Tennessee. To the east and south of this system is the basin drained by the Coosa, formed by the junction of the Ostanaula and Etowah rivers. Lying southeast of these rivers is the valley of the Chattahoochee, through which the river flows diagonally across the state in a southwesterly direction until it reaches the western border, when it turns southward and forms the southern half of the western boundary. As it enters Florida it is joined by the Flint, the united streams being known as the Appalachicola.

The Flint River flows southward through the western part of the state and is approximately parallel to the Chattahoochee through the greater portion of its course. The Ocmulgee and Oconee rise south of the Chattahoochee and flow southeasterly, uniting to form the Altamaha, which conducts their water to the Atlantic. The Altamaha is navigable to the junction of the rivers by which it is formed, a distance of 300 miles. South of the Altamaha is the Saint Mary's, forming a part of the boundary between Georgia and Florida. The Satilla is its chief tributary. The Savannah, with its extension, the Tugalo, forms the boundary between Georgia and South Carolina, and is navigable to Augusta, 300 miles. Many of these rivers furnish water power for manufacturing.

Climate. The northern half of the state is characterized by a mild and salubrious climate. The winters are not cold, nor are the summers extremely hot; this region is enjoyed by people from the North who wish to escape severe winters. In the coastal plain the summers are exceedingly hot and enervating, and along the coast, especially where the land is marshy, malaria and fevers are likely to attack those who are not acclimated. The middle portion of the state has an equable climate, somewhat warmer than that in the northwestern part. The rainfall varies, being heaviest in the north, but its average is about forty-nine inches for the entire state.

Mineral Resources. The mountainous region has some minerals, the most important of which are coal, iron, bauxite (the ore of aluminum), manganese, marble and granite, and throughout the state brick clay and pottery clay are abundant. The coal is of a semi-bituminous variety and is valuable for nearly all purposes, but the deposits are not large. The quarrying of marble has become an important industry. The Georgia marble is of excellent quality and strength and has acquired a wide reputation as a building and finishing stone. Iron ore and manganese are also quite extensively mined. Among other minerals found in small quantities are gold, silver and a few precious stones, including the amethyst and beryl; but the mining of these is a comparatively small industry.

Agriculture. Agriculture is the leading occupation, and nearly seven-tenths of the surface of the state is in farms. Cotton is the most important crop. The annual yield of corn, the next product in value, is worth about $115,000,000. In the southern part of the state melons, peanuts, garden vegetables, oranges, pineapples, lemons and other semi-tropical fruits are raised in large quantities. Georgia is third among the states in the raising of peanuts, and it is first in yams and sweet potatoes. The uplands in the interior furnish an abundance of pasturage, and sheep, cattle and hogs are raised in large numbers. As in other Southern states, many of the farms are rented to negroes, by whom most of the work is performed with simple tools and implements. Extensive areas are covered with forests. In the north, these include the hard woods, such as oak, hickory and maple, while in the south the long-leaved pine is the prevailing timber tree.

Manufactures. Since 1900 Georgia has made rapid strides as a manufacturing state, and in this regard it now leads the South. The most important manufacturing industry is that of cotton goods. A large number of mills are in operation, and they have attained remarkable success. The production of hosiery and other knitted goods is also important. There are a number of mills for the manufacture of woolen fabrics. In the northwest are numerous iron works, and the manufacture of cotton gins and other machinery gives employment to a large number of people. The increased production in corn and wheat is also increasing the grist mill products from year to year. The production of lumber, turpentine and rosin is very important, since Georgia is one of the leading pine-lumber states of the south.

Transportation. The large number of navigable rivers affords easy and cheap water transportation, but these are not as much used as formerly, because of the large number of trunk lines of railway now traversing the state in all directions. The important railway centers are Atlanta, Savannah, Augusta, Macon, Columbus, Athens and Waycross. By means of the numerous lines, which have a mileage of over 7,000 miles, all important towns have railway communication, and every county is crossed by one or more lines, while the trunk lines form direct communication with Northern states.

Commerce. The commerce of the state is important. The large output of cotton, corn and marble, as well as the production of cotton goods and other manufactures, together with pine lumber and other forest products, gives Georgia an extensive export trade. Georgia pine is a most important article of commerce.

Government. The legislative department, called the general assembly, consists of a senate of forty-four members and a house of representatives of not more than 184 members, the members of each being chosen for two years. The senators are apportioned among districts, and the representatives among the counties, on the basis of population. The legislature holds biennial sessions, which are limited to fifty days. The governor, comptroller-general, secretary of state and treasurer are elected by the people, the governor holding office for two years and being ineligible for four years after he has served two consecutive terms. The judicial power is vested in a supreme court consisting of a chief justice and five associates, chosen for six years by popular vote, and superior courts, which are held in each judicial district. The judges for these courts are also elected by the people for a term of four years.

History. The territory of Georgia was explored in 1540 by De Soto and in 1562 by Ribaut. It was a part of the original Carolina grant, but when the two Carolinas were made royal provinces the territory between the Saint Johns and Savannah rivers was reserved as Crown land. In 1732 a company was organized by James Oglethorpe to found a colony in America as a refuge for poor debtors and religious fugitives of Great Britain and Germany. Savannah was established in the following year. The colony was liberally governed and prospered during its early history. Oglethorpe returned to England in 1743, and after his departure the colony rapidly declined under the unfortunate rule of his successors. At this time was introduced trade in slaves and rum. The charter was surrendered in 1752, and Georgia was organized as a royal province. By the proclamation of 1763 the territory of Georgia was increased to include a strip of land extending to the Mississippi.

Georgia bore its part in the Revolutionary War, following the lead of other states, and suffered severely at the hands of the British and Tories. It ratified the Articles of Confederation in 1778 and was among the first to ratify the Federal Constitution (January 2, 1788). After the war there were Indian disturbances which eventually brought a collision with the United States government regarding the control of Indian lands. This was finally settled when the last of the Cherokees removed from the territory in 1838.

In spite of the strong hold of slavery upon the commercial interests of Georgia, there was a decided Union sentiment in opposition to secession, led by Alexander H. Stephens, but the state seceded in January, 1861. It was the scene of important military operations during the Civil War, including the march of General Sherman, and at the close of the struggle it suffered serious commercial depression. A bitter contest was waged in Georgia during reconstruction times, and twice the refusal of the legislature to conform to the requirements of Congress caused the state to be placed under military rule. It finally was admitted July 15, 1870. During this time the carpet-bag government was in full force and the wealth of the state was wasted in wretched speculations and frauds. In recent years prosperity has returned.

One of the most progressive legislative acts within recent years was the appropriation in 1916 of funds for agricultural schools. The same legislature provided for a statewide primary system for nominations for public office. The prohibition law was made more strict in 1917; it provided that no liquor containing even one-half of one per cent alcohol could be sold in the state.

Related Articles. Consult the following titles for additional information:

Fall Line
Oglethorpe, James
Piedmont Region
Pine

CITIES

Albany
Americus
Athens
Atlanta
Augusta
Brunswick
Columbus
Macon
Rome
Savannah
Waycross

GEORGIA, a republic in Transcaucasia, formerly the main part of the Russian governments of Tiflis and Kutais and comprising the ancient kingdoms of Colchis, Iberia and Albania. Tradition traces the ancestry of the Georgians back to Japhet, but their history first becomes trustworthy at the time of Alexander the Great, when they were freed from foreign rule and united into one kingdom under Pharnabazus, 324 B. C. Toward the end of the fourth century they became Christianized. For a time they were under the Arabs, but toward the end of the eleventh century regained their independence. From 1184 to 1212 they were in the height of their prosperity under Queen Tamara, who married a Russian prince. In 1799 George XIII resigned his throne in favor of the Russian emperor Paul, and in 1802 Emperor Alexander proclaimed the territory a Russian province. The new republic was organized after the World War, in 1919.

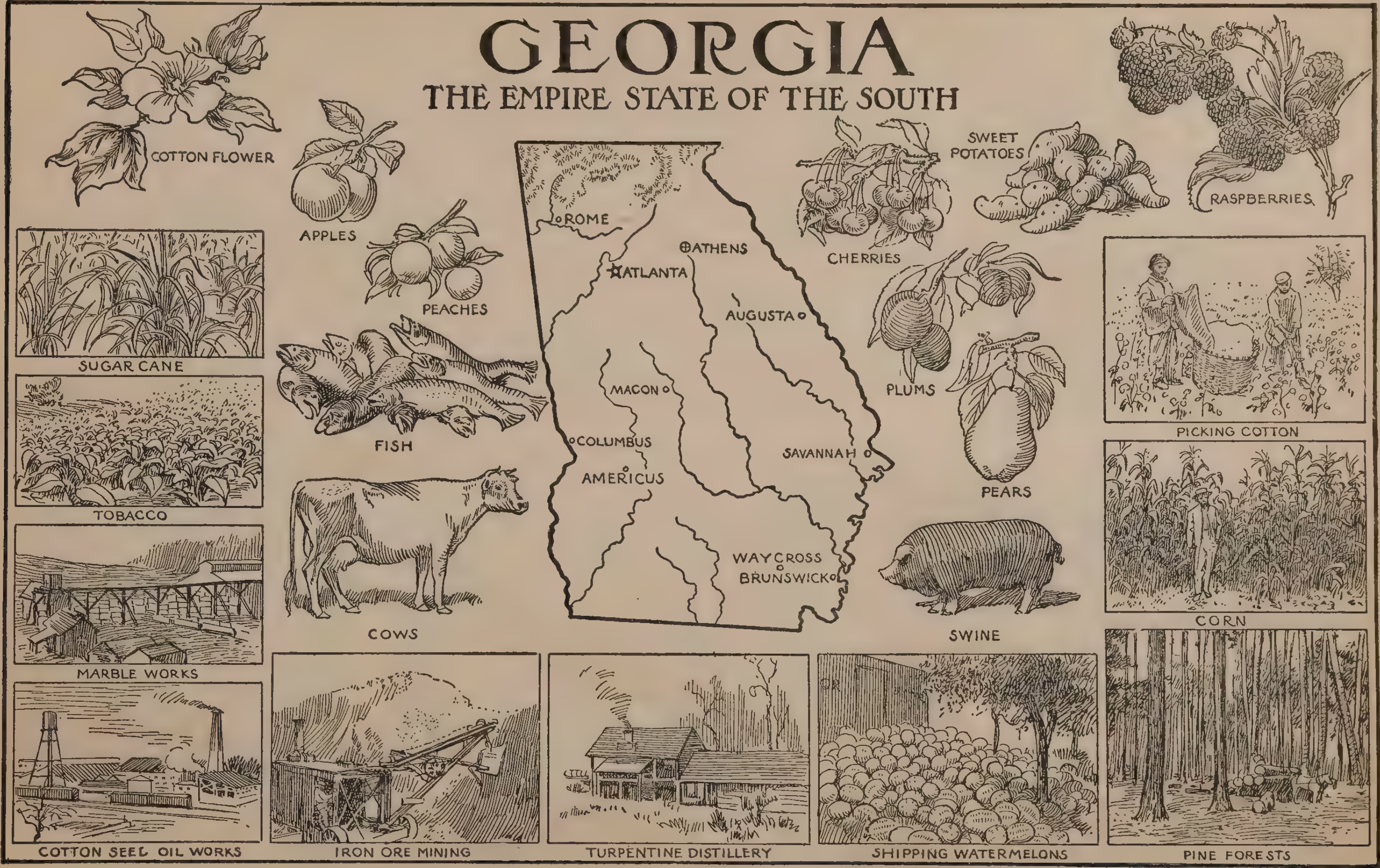
GEORGIA, STRAIT OF, a large strait of the North Pacific Ocean, between the continent of North America and Vancouver's Island. The strait is about 250 miles long and thirty miles wide. It communicates with the ocean on the north by Queen Charlotte's Sound, and on the south by the Straits of Juan de Fuca.

GEORGIA, UNIVERSITY OF, the oldest state university in the United States, chartered in 1785. According to the provisions of the charter, the primary and secondary schools of the state of Georgia are officially connected with the university. The university proper is located at Athens and includes the Franklin College of Liberal Arts, the State College of Agriculture and Mechanic Arts, the law school, the state normal school and the graduate school. In addition, there are a number of other colleges, located in different parts of the state, which are affiliated with the university. Tuition is free to all residents of the state, except in the professional schools. The student enrollment is about 1,275, and the faculty numbers about ninety. There are 41,000 volumes in the library.

GEORGIAN, *jawr'jan*, **BAY**, a large bay in Ontario, constituting the northeast part of Lake Huron. It is partly separated from

GEORGIA

THE EMPIRE STATE OF THE SOUTH



Items of Interest on Georgia

More than half the state, south of a line from Augusta, Milledgeville and Macon to Columbus, is included in the Coastal Plain; the uplands are subdivided into four parts, the largest and southernmost being the Piedmont Belt, then the Blue Ridge, the Great Valley Region, and in the extreme northwest the Cumberland Plateau.

Georgia has many rivers, including a few of considerable size; the Savannah drains most of the eastern section, the Altamaha the central part, and the Appalachicola the western part, other important streams are the Flint, Chattahoochee, Ogeechee and Satilla.

Georgia is noted for the variety of its soils. In the northern part sands and clays predominate, but in the extreme northwest, much of which is underlaid by limestone, the soil is loamy and very fertile; within the limits of the Coastal Plain the soils vary from sand to loam and heavy clay; the bottom lands along the rivers are generally rich in vegetable matter and are very fertile, the coast soils are often unsuited for cultivation on account of the swamps and marshes.

The mineral resources of Georgia are as varied as its climate and soils, thirty-nine different mineral products being found within its borders.

The most important mineral is stone; Georgia ranks seventh among the states as a producer of granite, and second of marble.

Limestone, cement, clay, and iron are mined in considerable quantities; the clay deposits are remarkable for their freedom from impurities.

Much of the asbestos found in the United States comes from the Sall Mountain mine in White county; Georgia produces more than all the other states combined.

Coal, coal tar, ammonium sulphate, illuminating gas, and some gold, silver and copper are also found in small quantities.

The state produces nearly one-half of the manganese found in the United States.

The principal occupation in Georgia is agriculture, which uses seventy per cent of the area and sixty per cent of the wage-earners; with the exception of a few tropical fruits, almost everything cultivated elsewhere in the United States can be raised profitably.

The principal crop is cotton, to which about one-third of the total area under cultivation is devoted; Georgia ranks second only to Texas as a producer of cotton.

The state is second in the production of sweet potatoes and third in peanuts.

It leads the United States in the raising of watermelons.

The tobacco crop, which is of very high grade, averages nearly 1,500,000 pounds a year.

The most important manufactured products are cotton goods, in which Georgia ranks fourth.

In the manufacture of cottonseed oil and cake Georgia is second only to Texas.

The state also ranks first in the value of fertilizers produced.

Questions on Georgia

How does the area of Georgia compare with that of other states east of the Mississippi?

Describe briefly the surface of the state.

What are the principal rivers?

In a general way show the relation between the surface conditions and the climate.

What are the leading mineral products?

How does Georgia rank as a producer of asbestos? Of marble?

What is the principal product of the fisheries?

How does Georgia rank as a producer of peanuts?

Name five other important crops.

Name five leading manufactured products and give Georgia's rank in each.

Why is Atlanta important?

Name five other large cities. Give the chief industries of each and any other reason why you think they are important.

the main body of the lake by the peninsula of Cabot's Head and the island of Great Manitoulin. It is about 120 miles long and fifty miles broad.

Georgian Bay Ship Canal, the name given to a proposed canal from Georgian Bay to Montreal, a distance of 440 miles. On 346 miles of the route advantage will be taken of lakes and rivers. From the Great Lakes to the sea the canal will effect a great saving in time, mileage and expense. A canal commission reported favorably in 1916, but work could not be begun during the World War. The estimated cost is $125,000,000.

GERANIUM, *je ra'ni um,* a large family of flowering plants, cultivated for their showy flowers and beautifully marked leaves. There are about 200 species of ornamental geranium, more properly called *pelargonium.* The blossoms grow in tight clusters on a sturdy stem, and range in color from white to deep red. The plant has a strong, short sappy trunk and branches of a similar structure. It is very hardy. The foliage of most species has a velvety texture and a spicy fragrance; the rose geranium leaf has a particularly delicious scent. A species of wild geranium called *crane's bill* is found in many parts of the United States, Canada and Great Britain. It grows thin and lank, has small clusters of magenta flowerets and long, beak-shaped fruit, from which it derives its name. Another wild species, known as *alfilaria,* grows in abundance on the Pacific coast, where it is a valuable forage plant.

GERARD, *je rard',* JAMES WATSON (1867–), an American diplomat who held the position of ambassador to Germany at the time the United States broke off diplomatic relations with the Imperial government. Gerard was born in Geneseo, N. Y., and was educated at Columbia University. Between 1908 and 1911 he was associate justice of the New York supreme court. He took a prominent part in Democratic politics in the state, and in 1914 was an unsuccessful candidate for United States Senator. President Wilson appointed him ambassador to Germany in 1913, and until 1917, when diplomatic relations were severed, he represented his country with courage and honesty in an exceedingly difficult post. On his return to the United States Gerard lectured on various phases of the war. He published *My Four Years in Germany* and *Face to Face with Kaiserism.*

GERMAN EAST AFRICA, until 1916 the most important and largest of German colonies, secured originally to Germany through colonization, but added to by treaties and territorial exchanges. It lies in Africa on the east coast, and is bounded on the east by the Indian Ocean; on the south by Portuguese East Africa and Lake Nyassa; on the southwest by British Central Africa; on the west by Lake Tanganyika and Belgian Congo, and on the north by British East Africa. Its northern boundary crosses Lake Victoria Nyanza. The area is estimated at 384,180 square miles. The island of Mafia, off the coast, belongs to the colony.

The coast of German East Africa is low and flat, but there are high plateaus in the interior, from which rise lofty mountain groups, among them Kilimanjaro, a volcanic peak 19,720 feet high and the highest point in Africa. The country is watered by the rivers Ruaha, Mzombe, Mgeta and Rufigi and their tributaries, none of which are navigable. There are some unimportant streams in the interior, which drain into lakes Tanganyika and Victoria Nyanza and thence into the Congo and the Nile. The chief industries are agriculture and cattle-raising. Millet, wheat, cotton, sesame, tobacco, copra and rice are grown, and bananas are cultivated along the coast. The chief exports are ivory, rubber, cereals and coffee. Coal, iron, salt and a little gold have been found.

In 1916 the British army in Africa started a strong campaign to wrest the colony from the Germans, whom they had already deprived of German Southwest Africa. One of the policies of the entente allies in the World War (which see) was to capture all German Colonies. British forces succeeded in taking the colony, and the peace conference gave Great Britain the mandate to govern the country, now called Tanganyika Territory. Two populous sections were placed under Belgian administration. Population, estimated, 4,000,000, of which about 2,500 are white. (See Tanganyika.)

GERMAN LANGUAGE, the language spoken by the majority of the inhabitants of Germany, and by several million others in various parts of the world.

The history of the language is divided into three parts—Old High German, to 1100; Middle High German, from 1100 to about 1500; New High German, from about 1500 to the present time. The limits are approximately the same as those assigned to the three periods of the English language. The word "High" in each case has a purely geographical significance. In the earlier periods of the language, the dialects of South Germany, as the section was best known before the World War, are designated as High German, from the more mountainous character of those districts, while the language of North Germany was called Low German. The Low German dialects, as well as the High, were spoken in the periods referred to, but as the works of literature preserved belong chiefly to the latter dialects, the whole period is so characterized. By examination of dialectical peculiarities, scholars are able to locate specimens of literature from those periods with considerable exactness. In the same way today a German peasant's native province can be approximately determined. These peculiarities, which the printing press and a uniform educational system have obliterated in a great measure in the spoken language, especially in the last generation, still survive in the more isolated districts, and it is quite possible to find two peasants from different parts of Germany who cannot make themselves understood by each other. In modern printed German there are no considerable variations, but in speech even the educated will usually betray their dialect in some peculiarity of pronunciation or vocabulary.

The most powerful agency in fixing a common written language for Germany was Luther's translation of the Bible (1522), and this is conveniently made the beginning of the New High German period. The fact that this work had a wide circulation made its dialect, which was intermediate in character and geographical position, familiar throughout Germany, and subsequent writers who wished to reach a large circle of readers naturally employed it. The first German grammar appeared in 1540, and subsequent grammars and dictionaries gradually fixed the forms of the language.

GERMAN LITERATURE. See LITERATURE, subhead *German Literature.*

GERMAN MEASLES. See MEASLES.

GERMAN SILVER, or **NICKEL SILVER,** is an alloy of copper, nickel and zinc in varying proportions. Spoons and forks are made from two parts copper, one nickel, one zinc; knife and fork handles from five parts copper, two nickel, two zinc, a mixture closely resembling alloyed silver (addition of lead produces an alloy well fitted for casts and candlesticks). Iron or steel makes the alloy whiter, harder and more brittle. German silver is harder than silver and takes a high polish. It is affected by some acids, notably vinegar and by some salt solutions.

GERMAN SOUTHWEST AFRICA, a former German possession on the western coast of Africa, 322,000 square miles in area, extending for a distance of 900 miles, from the Orange River to the Cunene River, excepting Walfish Bay, which is a British possession. The territory became German through establishment of trading stations as early as 1883. The north part is called Damaraland, and the southern, Great Namaqualand. The region is mostly a plateau, with mountains rising in the Onataka to a height of 8,800 feet. The chief industry is cattle-raising. In the western part are fine pastures and much fertile land. Little has yet been done to develop the deposits of gold, copper and lead. The exports are ostrich feathers, hides, horns, ivory and wool. The harbors are poor, and most of the commerce passes through Walfish Bay. In 1915, in the second year of the World War, British South African troops captured the small German force defending the colony and formally took possession of the region. After the war the Germans confidently expected the return of this colony and German East Africa to them, but the victorious entente nations rejected Germany's claim. The peace conference gave its mandate to govern the country to the Union of South Africa, to be responsible for the same to the league of nations. Population, 200,000.

GERMANTOWN, BATTLE OF, an important battle of the Revolutionary War, fought October 4, 1777. A British force under General Howe was in possession of Germantown, a suburb of Philadelphia. The Americans under General Washington attacked this position in two columns and were at first successful, but a fog arose and two American forces approached one point from opposite directions and fired into each other's columns, immediately creating a panic among the Americans and causing defeat when victory was practically assured. The daring and skill of Washington's plan deeply impressed European military critics and was one of the causes which led to the French alliance.

Germantown, formerly a separate suburb of the city of Philadelphia, is now within the city limits. It is noted for the beauty of its surroundings and for its parks. It was settled in 1683 by Palatinate Germans. The first paper mill in America was established there in 1690, and the first American edition of the Bible was published in Germantown in 1743.

GERMAN UNIVERSITIES. See UNIVERSITY, subhead *German Universities.*

A castle on the Rhine

GER′MANY, a country in the central part of Europe, created an empire of twenty-six states in 1871, at the close of a brief but victorious war with France, through the genius of Bismarck. Forty-three years later the two nations again were at war, this time engaged in a terrible struggle that finally involved three-fourths of the world. It was the fate of Germany, after a period of amazing prosperity and development, to be confronted by the strongest coalition in history. Two weak European states and the decadent Turkish Empire were its sole allies; ranged against this alliance were all the first-class powers of the continent of Europe, the British Empire and the American republic, besides a number of small nations in different parts of the world. Late in 1918 the military leaders of Germany announced that they could no longer carry on the struggle, and that the government must ask for an armistice. The long-suffering German people, who had been buoyed up by deceitful promises of victory, turned against their rulers and formed a republic, while their once popular emperor, William II, fled ignominiously to Holland. The events that followed are summarized in the subhead HISTORY, on pages 1502–1503.

Location and Area. Germany as it existed at the outbreak of the World War had the following boundaries: on the north were the North Sea, Danish Jutland and the Baltic; on the east, Russia and Austria-Hungary; on the west, France, Belgium and the Netherlands; on the south, Austria-Hungary and Switzerland. These boundaries were changed in certain respects after the treaty of peace was signed, as Austria-Hungary was broken up at the close of the war, and Germany also suffered losses of territory.

Imperial Germany had an area of 208,780 square miles; that is, the country which fought against three-fourths of the world was 7,000 square miles less in area than Texas, the largest American state. The new Germany was deprived of Alsace-Lorraine, which reverted to France by terms of the peace treaty; it lost territory to Poland; suffered the loss of Danzig and a corridor leading from that city to Poland; had to cede 382 square miles to Belgium, and for a period of fifteen years, at least, lost the rich Saar coal region. Besides, there was ordered a vote in Schleswig which should determine sovereignty for that province. These were continental losses only,, and totaled 35,135 square miles; there was a possibility of further losses of 8,572 square miles. All of Germany's colonial lands were taken, without hope of recovery. The definite area of Germany proper was reduced in 1919 to 173,544 square miles, and numerous decisions were yet to be made.

The People. In 1910 the population was 64,925,993; in 1914, according to official estimate, it was 67,812,000. About 4,000,000 were of non-German blood—Poles, Danes, French and Czechs. The density of population was about 311 to the square mile, or about ten times that of continental United States. Before the war there were twenty-three cities with populations over 295,000, and Berlin (the imperial capital and metropolis), was the second largest city on the continent, ranking next to Paris.

In 1918 official estimates were issued showing that the great munitions centers had increased so rapidly in population that the relative standing of several cities was changed. Bockum reached a population of 764,774, attaining third place, following Berlin and Hamburg. The next four, in order, were Leipzig, Cologne, Duisburg and Munich. Other important cities include Dresden, Breslau, Frankfort, Nuremberg, Hanover, Magdeburg, Düsseldorf, Chemnitz, Stettin, Essen and Weimar. (See list at end of this article.) The number of people lost to Germany by cessions of territory in the peace treaty was not definitely known in June, 1919.

The Germans belong to the Teutonic division of the human family, and in their own tongue are known as *Deutsch*. In some respects they are among the strongest of all nationalities, and they have very definite characteristics. Visitors who go to Germany from other countries are wont to marvel at the precision and systematic orderliness manifest everywhere—in the arrangement of orchards and fields, in the laying out of streets, in the construction of public works, and so on. This precision is typical of a people who are more thorough and persistent than they are creative; more apt at developing and perfecting new ideas than they are in originating them. In all lines of intelligent activity, however, they have made important contributions to the world's progress—in education, philosophy, science and literature—while in music they have a place held by no other people.

It has been generally accepted that the ardor with which the German people entered the World War and the ruthlessness with which they carried on the struggle were the result of a faulty education which made them a militarist nation. They were taught that it was Germany's destiny to dominate the world, that other nations were backward or degenerate, and at first the war had a religious significance for them. The doctrine of the superiority of the state and the inferiority of the individual had a firm place in German thought, and the people as a whole accepted the theory with docility. The revolution of 1918 and the subsequent events show that the war broke down many false ideas.

Language. See GERMAN LANGUAGE.

Literature and Art. See LITERATURE, subhead *German Literature;* PAINTING; SCULPTURE.

Education. In Germany all grades of education are under the control of the government, the minister of public instruction being at the head of the educational system. Three classes of schools are maintained: The primary, or folk, school, in which attendance between seven and fourteen years is compulsory; the secondary schools, represented by the *gymnasia* and *realschulen,* and the higher institutions, including technical schools and universities. Children who desire may be transferred from the folk schools to higher schools as soon as the rudiments are learned. This is usually the custom of those who plan to have more than an elementary education. Some of those who pursue the eight-year course of the folk school go later to trade schools. Primary schools are established in all villages and rural communities and are supported by government and local taxation. All teachers are licensed by the government and are required to be graduates of normal schools. Teaching, even in the elementary schools, in Germany is a profession, and one enters upon it with the intention of making it his life work. After serving the required time, the German teacher is retired on a pension.

The gymnasia are secondary schools which give special attention to the ancient classics and fit their students for the classical departments of the universities, while the *realschulen* give attention to modern languages and sciences. Technical schools are numerous and provide for instruction in all lines of skilled labor, as well as in the branches of civil and electrical engineering. There is practically no illiteracy in Germany. For a description of German universities, see UNIVERSITY.

Religion. About sixty-one per cent of the inhabitants are Protestant, and thirty-six per cent are of the Roman Catholic faith. There is no established state Church; freedom of worship prevails. There are about 600,000 Jews in Germany.

Surface and Drainage. Germany is naturally divided into three surface regions, the Alpine foreland, the central highlands and the great plain. The first occupies the extreme southeastern portion of the country and contains a part of the Alps. There are found the highest elevations and the most rugged mountain scenery. To the north and west of this and separated from it by the basin of the Upper Danube is the central highland region, extending westward from the Carpathian Mountains to the Rhine and northward to within about 100 miles of the North Sea. The highland region is traversed by numerous ranges of low mountains, among the most important being the Harz, the Riesengebirge, or Giant Mountains, the Vosges and the Erzgebirge, or Ore Mountains. All of these are low mountains with rounded summits which have been denuded of most of their soil. The valleys are comparatively shallow, having been filled with the débris carried from the mountains by ice. This portion of Germany presents a diversified appearance of low mountains and broad valleys, and it is covered with a fine growth of vegetation and watered by numerous streams. To the north of the central highlands and occupying fully one-third of the country is the great plain, which extends from the eastern boundary to the North Sea. This is a portion of the great Asiatic plain, which covers a large part of eastern and northern Europe. This plain is not perfectly level; its highest portions are about 600 feet above sea level, and it has a gradual slope towards the north.

The rivers of Germany are divided by the central highland region into two systems, those flowing into the Black Sea and those flowing into the North and Baltic seas. Of the first system the Danube is by far the most important, and it drains only the southeastern portion. The other system includes all of the other important rivers and drains most of the country. Going from the west eastward, these rivers, in order, are the Rhine, the Ems, the Weser and the Elbe, flowing into the North Sea; and the Oder and the Vistula, flowing into the Baltic. Of these the Rhine is the most important. It has its source in Switzerland and flows entirely across Germany, as does the Elbe, which drains a good portion of Bohemia. The Weser and the Oder are limited to German territory, while the Vistula drains a large portion of Russia and simply finds an outlet through Germany. All of the important streams flowing into the Baltic empty into shallow lagoons, called *haffs*. Between the Oder and the Vistula are a number of less important streams, and the Memel drains the extreme northeastern section.

The mountainous region in the south and southeast contains numerous lakes, which in the clearness of their water and the picturesqueness of their surroundings resemble the lakes of Switzerland. In the lowlands in the northern and northeastern portions there are also numerous shallow lakes. These have low shores, which rise gradually to the level of the surrounding country.

Climate. Germany has a mild, temperate climate. The variation in temperature is more marked from west to east than from north to south. In general the temperature becomes lower as we pass from the southwest to the northeast, the altitude of the highland region offsetting in temperature whatever advantage might otherwise be gained by latitude. The western portion has a higher annual temperature than the eastern, because of the influence of the warm winds which blow from the Atlantic during a good portion of the year. The mean temperature for Southern Germany in July is a little above 70°, while that for Northern Germany is a little below 70°. The winter contrast between the western and eastern portions is noticeable in the condition of the rivers flowing into the North Sea and those flowing into the Baltic. The former are scarcely ever frozen, while the latter may be obstructed by ice for several weeks or even months. Because of the cold water in the Baltic, the spring in the northeastern portion is cold and late.

The rainfall varies considerably in different localities, being heaviest in the mountain regions and along the western coast. In some sections it averages forty inches per year, while in most regions the average is about twenty inches, and in a few localities it is less than this. The general average is about twenty-eight inches.

Mineral Resources. Germany is the leading country of the continent in the production of coal and iron, and is exceeded only by the United States and Great Britain among the countries of the world. An abundance of these products has made possible great progress in manufacturing. The iron and coal regions are quite generally distributed over the country, but are most important among the highlands in the central and southern part. The greatest coal field is in the southwest and is an extension of the Belgian coal field. Other minerals of importance are silver, of which Germany produces about one-half of the entire output of Europe; copper, zinc, lead and nickel. Among the valuable stones are building stones of different kinds and lithograph stone. Salt is found in large quantities in some localities, as are compounds of potash, which are of great value in the manufacture of glass and other commodities. Amber of superior quality is obtained along the Baltic.

Agriculture. About one-half of the land is devoted to agriculture, a little more than one-fourth of it is under forests and about one-tenth is either unproductive or is covered by buildings. Agriculture is not the leading occupation, but it engages nearly one-third of the population. There is a greater variation in the size of farms than is found in France and Belgium, but the number of small farms is very large. Many of the smallest farms are cultivated by those who devote a portion of their time to other occupations. The soil and climate are in general well adapted to agriculture, except in the northern and northeastern portions, and even here the scientific methods of fertilizing and tilling the soil enable the farmer to reap good returns for his labor.

The products vary widely, because of difference in soil and climate. In the southern portion corn, hops and fruits are the most important products, except on the higher elevations, where rye, oats and potatoes are extensively grown. The northern portion is largely devoted to the growing of grains, among which rye takes the leading place, followed by oats. Here, also, as well as in the central portion, extensive areas are devoted to the raising of sugar beets and potatoes. Considerable barley and wheat are grown in these regions. The valleys of the Rhine, Moselle and a few other rivers are devoted almost entirely to the culture of the grape and the production of wine, and Rhine wines, because of their excellence, have become known throughout the world. In general, the most improved tools and agricultural implements are used, and the latest and most effective methods are employed by the German farmers, all of whom have received more or less technical education, which they add to their practical experience in managing their farms. A very large proportion of the farms are tilled by the owners.

Manufactures. Normally Germany is one of the leading manufacturing countries of the world, being foremost upon the continent of Europe and exceeded only by the United States and the United Kingdom. The manufacturing industries include a great variety and are very generally distributed. In normal times the most important line is the manufacture of textiles, including cotton, woolen and silk goods; during the World War metal products directly connected with the conduct of the war naturally had first place, but the iron and steel manufactures are always of very great importance. In the production of some iron and steel goods Germany leads the world, particularly in the manufacture of hardware, including cutlery and tools, certain forms of heavy machinery and other articles, such as marine engines, heavy artillery and armor plate for battleships. The manufacture of chemicals, scientific instruments and small wares is also important, and in each of these lines the Germans exhibit great skill. Their scientific instruments are considered the most accurate in the world. Other important industries include brewing, dyeing, wood carving, type founding and the manufacture of jewelry, gold and silver ware, printers' supplies and toys. Because of the scarcity of many kinds of raw material and the demands of the war industries, German ingenuity applied itself to the manufacture of various substitutes during the war. Paper was used, for example, to make clothing and string, and many ingenious food substitutes were placed on the market.

Transportation. The Rhine, the Weser, the Oder, the Elbe and the Vistula are all navigable for long distances. Many of the other streams have been canalized, and all important navigable rivers are connected by canals, so that the country has a complete and convenient system of waterways, while the construction of a canal across the peninsula of Jutland has afforded a convenient and short outlet from the Baltic to the Atlantic. The railway system is one of the most complete in the world and comprises about 39,000 miles. Berlin is the great railway center, and from this city trunk lines extend not only to important points in Germany but to all important cities of Europe. Carriage roads are numerous and good, and telegraph lines, telephone lines and the best of mail service are maintained.

Commerce. Germany was formerly one of the greatest commercial nations. The excellence of its manufactured products and the systematic method of introducing these to the various countries enabled it to develop an extensive foreign trade. The leading exports consist of manufactured goods, particularly textiles, iron and steel products, chemicals, dyes, malt liquors, scientific instruments, small wares, jewelry and gold and silver ware, while the chief imports consist of food stuffs and raw material for the manufactures. At the outbreak of the great war the value of the total foreign commerce was averaging about $4,600,000,000 a year. Russia was the most important seller and Great Britain the leading buyer. During the war German merchant ships were driven from the ocean, and Germany could carry on trade only with its allies and the neutral countries of Europe. The rehabilitation of its foreign commerce will be one of the nation's great tasks in the future.

Colonies. Before the World War Germany possessed a colonial empire in Africa, Asia and the Pacific, covering 1,140,115 square miles, as follows:

COLONIES	AREA
Togoland	33,668
Kamerun	305,019
German Southwest Africa	322,432
German East Africa	384,170
New Guinea	92,664
Caroline Islands	956
Samoa	993
Kiao-chau	213
Total	1,140,115

By terms of the peace treaty none of this territory was left to Germany. (See the articles on these titles.)

Government. On February 6, 1919, the National Assembly of the German republic, elected by universal suffrage, met in Weimar under the leadership of Chancellor Ebert, who was subsequently elected Provisional President of the German state. A new constitution was proposed, containing, among other provisions, the following:

> The national territory shall consist of the former German states as well as other states that may, after a plebiscite, desire to be incorporated with Germany. The flag of our new republic will be black, red and gold.
>
> The generally accepted rules of international law shall be a basic part of the German law.
>
> The national law shall supersede the state laws of the various German states, which are empowered to combine wholly or in part for the purpose of creating a more powerful membership in the nation. These states will be represented in the government by a National Council. Each member of the Council can introduce bills, but a bill to be introduced to the Assembly must have the assent of the Council.
>
> Full freedom in religion, art and science is guaranteed.
>
> Labor, as the greatest national wealth, is especially protected. Personal freedom of dwelling and property are guaranteed, as is secrecy of the postal service.
>
> Details shall be determined by the national government regarding the regulation of the elections. The government will meet each year on the first Monday of December at the capital of the government.
>
> The President can call the Assembly earlier and must do so if at least one-third of the members demand it be called. A court to control the voting would consist of three members of the Assembly and two members of the National Council. The constitution may be changed by a two-thirds vote of the full membership of the Assembly.
>
> President must be at least thirty-five years old and a German citizen for ten years and will serve a seven-year term. He may be recalled through a popular vote. The President cannot be a member of the Assembly. The Assembly can demand the presence before it, of the Chancellor and the Cabinet. The head of the Cabinet, which has fourteen members, is the chancellor.

Under the Empire. The German Empire was a federated state, comprising four kingdoms: Prussia, Bavaria, Württemberg and Saxony; six grand duchies: Baden, Mecklenburg-Schwerin, Hesse, Oldenburg, Saxe-Weimar and Mecklenburg-Strelitz; five duchies: Brunswick, Saxe-Meiningen, Anhalt, Saxe-Coburg-Gotha and Saxe-Altenburg; seven principalities: Waldeck, Lippe, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, Reuss-Schleiz, Schaumburg-Lippe and Reuss-Greiz; three free cities: Hamburg, Lübeck and Bremen, and the imperial province of Alsace-Lorraine. The king of Prussia was emperor of Germany, the office being hereditary in the male branch of the royal family of Prussia. The legislative department consisted of the Bundesrat, or upper house, and the Reichstag. (Both are described elsewhere in these volumes under their proper headings.) Each state had its own system of laws and elected its own officials.

History. *Early Period.* Although mention is made as early as the time of Alexander the Great of German tribes on the Baltic coast, the first important occurrence in connection with them of which we have any authentic record was their defeat of the Roman consul Papirius, in 113 B. C. In 102 B. C. the Teutones were defeated by the Roman general Marius. Julius Caesar, in his *Commentaries,* gives an account of certain Germanic tribes whom he found between the Rhine and the Vosges, and he came into conflict in Gaul with a German king, Ariovistus. The name Germani was not used by the Germans in reference to themselves, but was probably formed by the Romans from a Gallic word. At various times in Roman history the Romans were concerned with different German tribes, and by the beginning of the Christian Era Roman dominion had been firmly established in Germany. When an attempt was made in A. D. 9 to force Roman customs upon the German peoples, they rebelled under the leadership of Arminius and completely defeated the Romans.

The Romans never again established themselves in Germany, and in the early centuries of the Christian Era they were often forced to defend themselves against the invasions of powerful German tribes, chief among whom were the Alemanni, the Franks, the Vandals, the Suevi, the Goths and the Lombards. Tacitus, in his *Germania,* gives a valuable and interesting account of the customs and lives of the early Germans. By 486 the ambitious Frankish chief Clovis had defeated the Romans in Gaul, and had set up his court on the future site of Paris.

Medieval Period. From the time of Clovis to the Treaty of Verdun in 843, the history of Germany is identical with that of France (see FRANCE, subhead *History*). By the Treaty of Verdun, Louis, the son of Louis the Pious, Charlemagne's son, received that division of Charlemagne's great empire which corresponded to modern Germany, and at that time the history of Germany as a separate country began. Louis reigned until 876 and made some advancement toward national unity. The son of Louis, Charles the Fat, succeeded for a time in reuniting the three kingdoms—France, Italy and Germany—but as he was unable to defend his empire against the Northmen, the nobles deposed him and elected his nephew, Arnulf, in his stead (887).

On the death of Louis the Child, the last of the Carlovingian dynasty, Conrad of Franconia was elected king. His reign was occupied with futile attempts to protect Germany against the invading Hungarians, and also with his quarrels with his powerful nobles. The most powerful of these, Henry of Saxony, succeeded Conrad in 919 as Henry I (the Fowler), first of the Saxon line. He is considered the creator of the German Empire. He united the dukedoms under his rule, built fortresses, reformed the military system and defeated the Wends and Hungarians. Otho I, son of Henry, came to the throne on his father's death in 936, and under him the royal power was greatly increased. He restricted the power of the nobles, defeated the Hungarians on the Lech in 955, acquired the crown of the Lombards in 961, and in the following year assumed the imperial title, thus founding the Holy Roman Empire, which existed until 1806.

Otho reigned until 973 and was succeeded by his son, Otho II (973-983), a well-meaning but somewhat weak monarch. Under Otho III, a young and enthusiastic king who was desirous of setting up a world empire with Rome as its capital, Germany was greatly neglected for Italy, and thus a condition of anarchy grew up. Henry II (1002-1024), the last king of the Saxon house, devoted more of his attention to his German than to his Italian possessions, and matters mended somewhat in Germany.

The first of the Franconian kings, Conrad II (1024-1039), was an energetic monarch who subdued the nobles and recovered the lands of the crown, and his work was carried on ably by his son, Henry III (1039-1056). During the reign of Henry III the right of the Pope to interfere constantly in the affairs of the empire was seriously questioned, and had Henry lived longer he might have put an end to this interference. His son, Henry IV, was an able king, but his constant troubles with the Pope allowed his great nobles to increase greatly their own powers. The decline of the royal power continued under Henry V (1106-1125) and Lothair (1125-1137), so that the title of emperor became almost an empty honor.

The period of the Hohenstaufen emperors, which began in 1138, is the most famous in medieval German history. It is marked by a bitter conflict between the imperial and the papal powers and by the beginning of the Crusades. Conrad III (1138–1152), the first of the Hohenstaufen emperors, took part in the Second Crusade, and Frederick Barbarossa, one of the ablest of the Hohenstaufen emperors, was drowned during the Third Crusade. Frederick's son, Henry VI (1190–1197), by marriage inherited the kingdom of Naples and Sicily, which remained in the possession of the Hohenstaufens until 1265. The possession of this territory by the emperors was a great injury to Germany, because it led them to neglect their German subjects. Henry VI attempted to make the imperial crown hereditary. The remaining kings of this line were Philip of Suabia (1198–1208), Frederick II (1215–1250) and Conrad IV (1250–1254). The period is filled with contentions with the Popes and the Italian cities and with constant internal strife. The royal power became insignificant, and neither German king nor Roman emperor in reality existed. Some of the rulers seemed little concerned about Germany, dividing their time between Sicily and the Crusades, and Frederick II, one of the ablest of medieval rulers, was not in Germany for fifteen consecutive years.

The period between the death of Conrad IV in 1254 and the election of Rudolph of Hapsburg in 1273 is known as the Great Interregnum. The right to choose the emperor had been gradually usurped by a few of the powerful nobles, who were called electors, and on the extinction of the Hohenstaufen line these electors practically offered the crown for sale. Various bidders appeared, and the two offering the largest bribes, Richard of Cornwall and Alphonso of Castile, were elected, but neither of them was crowned emperor at Rome nor acquired any real power. Finally, in 1272, the Pope ordered a new election, and in the following year Rudolph I (1273–1291), of the House of Hapsburg, was raised to the throne. He in a measure restored order and strengthened the royal authority. Through his defeat of Ottokar II of Bohemia he acquired lands in Southeastern Germany, the most important being Austria. This his son Albert received with the title of duke, and from this dates the rise of Austria and the House of Hapsburg (see AUSTRIA-HUNGARY, subhead *History*).

During the fourteenth and part of the fifteenth centuries there was but little of interest in the history of Germany. The imperial crown was passed around from one house to another and was openly offered to the highest bidder, the only care of the electors being to choose a prince not strong enough to endanger their authority. At one time there were three rival emperors ruling simultaneously. The first noteworthy event, besides the revolt of the Swiss, was the promulgation in 1356 by Charles IV (1348–1378) of the Golden Bull, which secured to four secular and three ecclesiastical princes the right of election and defined their power. This decree was in force till 1806. Another noteworthy event was the war of the Hussites.

Early Modern Period. In 1438 Albert II of Austria was elected emperor, and from this time until the dissolution of the Holy Roman Empire in 1806 the crown was regarded as hereditary in the Hapsburg family, although the electors always made a formal choice. The greatest of the early Hapsburg emperors was Maximilian I (1493–1519). His reign marks a strong tendency toward centralization and the material growth of the imperial authority. He was succeeded by his grandson, Charles V (1519–1556). Charles bestowed the Austrian possessions of the House of Hapsburg on his brother Ferdinand, who may be said to have founded the monarchy of Austria-Hungary. The Peace of Augsburg (1555), with which the struggle between the Catholics and Protestants for the time terminated, granted to the Lutheran states the right to establish the Protestant worship. Three provisions of the Peace of Augsburg were later the cause of much trouble. These were the provision that each prince could choose his state religion and banish all subjects not conforming to it; that any ecclesiastical prince on becoming a Protestant was required to give up office and lands, and that all lands not secularized in 1552 should forever belong to the Catholics.

During the reign of Charles's successor, Ferdinand (1556-1564), a counter reformation was begun by the Roman Catholics, and this movement spread rapidly and was continued during the reigns of Maximilian II (1564-1576) and Rudolph II (1576-1612). While Matthias (1612-1619) was on the throne, his cousin Ferdinand was crowned king of Bohemia (1617), and the attempt to force the Protestants of that country to accept him as their ruler led to the outbreak of the Thirty Years' War (1618-1648). The struggle closed in the reign of Ferdinand III, by the Peace of Westphalia. Germany by this treaty was divided into over 200 independent states, which owed only a nominal support to the emperor and became in fact simply petty monarchies. The imperial authority was completely wrecked and never afterward recovered. The war had devastated and impoverished Germany beyond measure, national feeling had been crushed out and all unity had been destroyed. Most of the rulers of the states were despots, who desired only to pattern themselves after Louis XIV, the absolute monarch of France. The War of the Palatinate (1689-1697), undertaken by Louis XIV, increased the desolation of the country.

Rise of Prussia. The interest of German history after the Treaty of Westphalia centers largely in the rise of Prussia (see PRUSSIA, subhead *History*). The Great Elector, Frederick William (1640-1688) gained increased territory for his state, and by strengthening the royal authority and forming a standing army brought Prussia rapidly forward. His son Frederick III (1688-1713), added to his title of elector of Brandenburg that of king of Prussia (1701). Nominally, the king of Prussia was still subject to the emperor, but from this time on, the emperors were in fact merely rulers of Austria, and the imperial dignity was but an empty honor. With the death of Charles VI (1711-1740), the male Hapsburg line became extinct. The attempt of Charles to secure by the Pragmatic Sanction his dominions to his daughter Maria Theresa, brought on the War of the Austrian Succession.

After a two years' interregnum, the electors chose Charles VII of Bavaria as emperor (1742-1745), and on his death Maria Theresa's husband, Francis I (1745-1765), was elected. His successor, Joseph II (1765-1790), tried to establish the imperial authority in Southern Germany, but was prevented by Prussia. In 1756 war broke out between Maria Theresa and Frederick the Great of Prussia (1740-1786). The advantage was decidedly with Frederick, and under this great ruler, whose statesmanship was as remarkable as his generalship, Prussia became the equal of Austria and showed itself as the one possible center for a united Germany. The French Revolution destroyed the remnant of the empire, and after the formation by a number of German states in 1806 of the Confederation of the Rhine, under the protectorate of Napoleon, Francis II formally resigned the imperial crown and the Holy Roman Empire ceased to exist.

Napoleon's plan to add Germany, or at least the states of the Confederation, to his empire, was frustrated, and at the Congress of Vienna, which met to restore order out of the chaos into which European affairs had been plunged, the German states were organized as a confederation, with the emperor of Austria as president (1815). The various German states were independent in internal affairs, and interstate disputes were to be settled by a diet. Each state was to have a constitutional form of government, but this provision was little observed until the revolutions of 1830 and 1848 forced the German rulers to accede to the demands of their subjects. In 1830 was formed the Zollverein, which secured free trade among the several states. In 1848 a national assembly met at Berlin for the purpose of framing a national constitution, but the rivalry of Austria and Prussia prevented any successful results, and the Prussian king, Frederick William IV, refused the title of emperor of the Germans.

Frederick William IV was succeeded in 1861 by William I (1861-1888), who soon called into his Ministry Bismarck. His policy of "blood and iron" made possible the final firm union of the German nation. The rivalry between Prussia and Austria was encouraged by Bismarck, who was making ready for the struggle which he knew would come. The final cause of the outbreak was the contention over Schleswig-Holstein, which had been taken from Christian IX of Denmark (see DENMARK, subhead *History*). War began between Austria and Prussia in 1866. The outcome was complete success for Prussia, and in 1867 the North German Confederation was formed, with the king of Prussia as president. The Catholic states of the south, Bavaria, Baden and Württemberg, held aloof. Just before the close of the Franco-German War, they joined the Confederation.

The Empire. By the treaty which followed the Prussian victories, France lost Alsace and Lorraine and was compelled to pay a large indemnity. The most important result to Germany, however, was the enthusiasm and the spirit of nationality awakened by the Prussian success. The German Confederation was changed to the German Empire, and William I, king of Prussia, was proclaimed German emperor on January 18, 1871. The title was to be hereditary in his family, and it descended at his death to his son, Frederick III. Frederick III lived but a few months after his accession and was succeeded by his son, William II. William at once showed his intention to keep personal control of the government and accordingly in 1890 dismissed Bismarck, who did not approve of his policy.

About 1883 Bismarck aided in the formation of the Triple Alliance, which included Germany, Austria-Hungary and Italy, and this was renewed in 1891 by Caprivi, the successor of Bismarck. Caprivi was succeeded in 1894 by Hohenlohe, during whose chancellorship rapid progress was made in the extension of German dominion in Africa. The murder in 1898 of two German missionaries in China gave Germany a pretext for demanding the cession of the port of Kiao-Chau in Shantung, China, and the murder of the German Ambassador in Peking in 1900 compelled Germany to take a prominent part in the expedition of the European powers against China. Under Count von Bulow and Theobald von Bethmann-Hollweg, the suc-

GERMANY

Since 1814

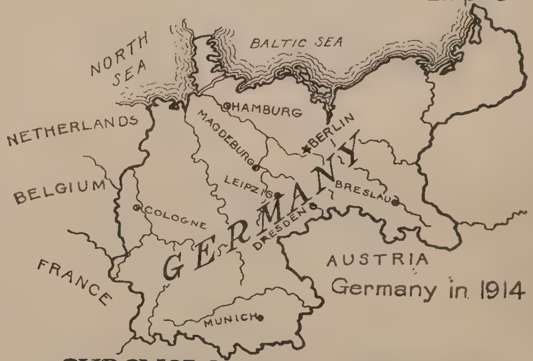
Bismarck,
"The Iron Chancellor"

Coat of Arms
of
Former Empire

William I
Founder of the German Empire

Germany's Most Beautiful Cathedral,
Cologne

William II
The Last of the Hohenzollerns



Germany in 1914

CHRONOLOGICAL SUMMARY

GERMANIC CONFEDERATION	1815
CARLSBAD DECREES	1819
FIRST GERMAN PARLIAMENT	1848
SOCIALISM APPEARED	1860
FRANCO-GERMAN WAR	1870
GERMAN EMPIRE FOUNDED	1870
BISMARCK BECAME CHANCELLOR	1871
ACCESSION OF WILLIAM II	1888
TROUBLE WITH VENEZUELA	1903
REVOLT IN SOUTH AFRICAN COLONIES	1904
TRIUMPH OF SOCIALISTS	1912
WORLD WAR BEGUN BY GERMANY	1914

ceeding Chancellors, Germany's vigorous foreign policy was continued.

The World War. In 1914 Germany was one of the most prosperous nations in the world. Its factories were busy, its ships were found all over the world, and its people were well fed and well clothed. There was little industrial unrest in the country, as the rate of unemployment was very low. Political unrest there was, however, because of restrictions as to suffrage, inequality of representation, etc., and the Social Democrats were opposing the militarist policies of the government. In 1913 an army bill had been passed authorizing a great increase in the standing army, a measure which caused consternation elsewhere in Europe but strengthened the Pan-Germans and "Junkers," who were openly working for the expansion of Germany. The outbreak of the war (for details, see World War) found Germany superbly prepared, and when the decisive step was taken all parties rallied to the support of the government.

The breakdown of German morale after four years of seeming unity and enthusiastic adherence to the cause may be attributed to several things. The allied blockade caused a scarcity of food, raw materials and other necessities that weakened the people physically and made them less capable of bearing the terrible burdens of war. Again, the reckless promises of the military leaders regarding a speedy victory over the entente and the nonfulfilment of these promises, added to the growing dissatisfaction with autocratic rule, caused widespread unrest. America's entrance into the war had been minimized and ridiculed, and when soldiers home from the front told the facts the people lost what little confidence they still reposed in their leaders. President Wilson's speeches, too, had made a profound impression on the Socialists who were growing increasingly stronger and more outspoken. Before the great March offensive, Philipp Scheidemann, a Socialist deputy, had advised making peace on the basis of the "fourteen points," but he had been overruled.

After the failure of the 1918 offensive and the collapse of Bulgaria the government could no longer resist the demands of the war-weary people, and on September 30 a change was made in the Cabinet, Prince Maximilian of Baden, a man of democratic tendencies, becoming Chancellor. Socialists were given other Cabinet positions, and appeals were made by the emperor for the people to hold firm. Early in October Germany appealed to President Wilson to open peace negotiations. In spite of these measures dissatisfaction continued, and German statesmen and generals were bitterly denounced in great mass meetings. In Kiel, Hamburg, Bremen and other ports there were mutinies among the sailors, who organized uprisings that spread to Berlin.

On November 7 the managing committee of the Socialists informed the Chancellor that Emperor William must abdicate. Unable to withstand the pressure, the imperial government collapsed, and a provisional-coalition Socialist Cabinet was formed with Friedrich Ebert at its head. On November 11 the new government signed armistice terms imposed by the allies, and the German army began its journey homeward. Not only did the emperor abdicate, but all of the hereditary rulers of the various states were thrust aside.

The next few months were a troubled period for the new Germany, as in addition to the usual confusion attending the transition from war to peace there were strikes, riots and uprisings of the radical Socialists, or Spartacans, who hoped to set up a soviet republic on the plan adopted by the Russian Bolsheviki. Civil war broke out in many parts of the country, and in Berlin two radical leaders, Karl Liebkneckt and Rosa Luxemburg, were killed by mobs. Nevertheless, the moderate elements succeeded in holding general elections for a National Assembly, in January, 1919, men and women voting on equal terms. Elections were held in all districts except those in Alsace-Lorraine (occupied by French troops), Posen (occupied by Polish troops) and Schleswig, where the Danish element expressed a desire to reunite with Denmark. The extremists—Pan Germans and radical Socialists—lost heavily, but out of 401 seats, 164 were won by the Majority Socialists, represented by Ebert and Scheidemann. These leaders became, respectively, President and Chancellor in the new republic.

The National Assembly convened on February 6. The permanency of the Ebert government was seriously doubted in view of the widespread disorders that continued in spite of severe repressive measures. Meanwhile Germany waited anxiously for the decisions of the Paris peace conference; a summary of the terms appears in various sections of this article, above. In addition to all penalties imposed on the country by the allies Germany was forced to accept the league of nations as a principle but not as a member. For all the penalties inflicted upon the defeated country, see VERSAILLES, TREATY OF.

Related Articles. Consult the following titles for additional information:

CITIES AND TOWNS

Aix-la-Chapelle
Altona
Augsburg
Baden
Barmen
Bayreuth
Berlin
Bingen
Blenheim
Bonn
Bremen
Bremerhaven
Breslau
Brunswick
Carlsruhe
Cassel
Charlottenburg
Chemnitz
Coblenz
Cologne
Danzig
Darmstadt
Dortmund
Dresden
Duisburg
Düsseldorf
Elberfeld
Ems
Erfurt
Essen
Frankfort-on-the-Main
Halle
Hamburg
Heidelberg
Kiel
Königsberg
Krefeld
Leipzig
Lubeck
Magdeburg
Mainz
Mannheim
Munich
Nuremberg
Oberammergau
Posen
Potsdam
Stettin
Stuttgart
Weimar
Wiesbaden
Wittenberg
Worms

STATES

Baden
Bavaria
Brandenburg
Brunswick
Hanover
Hesse
Mecklenburg-Schwerin
Oldenburg
Palatinate
Pomerania
Posen
Prussia
Saxony
Schleswig-Holstein
Württemberg

RIVERS AND MOUNTAINS

Alps
Black Forest
Danube
Elbe
Harz
Jura
Main
Moselle
Oder
Rhine
Riesengebirge
Vistula
Vosges

HISTORY

Arminius
Augsburg Confession
Balance of Power
Berlin, Congress of
Bethmann-Hollweg
Bismarck-Schöenhausen
Blücher, Gebhard von
Charlemagne
Charles V
Ebert, Friedrich
Franco-German War
Frederick I, II, III
Frederick I
Frederick William
Frederick William I, III, IV
Free Cities
Golden Bull
Hanseatic League
Henry III, IV, VI
Hessians
Hindenburg, Paul von
Hohenstaufen
Hohenzollern
Holy Alliance
Holy Roman Empire
Hussites
Liebknecht, Karl
Louis, The German
Ludendorff, Erich
Luther, Martin
Maximilian I
Moltke
Reformation
Seven Weeks' War
Seven Years' War
Succession Wars
Thirty Years' War
Triple Alliance
William I, II
World War

GERMINATION, *jur min a' shun,* the process by which the vegetable germ begins to develop into a plant. The conditions of germination are moisture, warmth and oxygen. The germ, which consists of a single cell, first shows evidence of germination by swelling. It then divides, becoming a two-celled *embryo.* One or both cells then grow to mature size, in process of which growth the cell casing is broken. The two parts separate; the young plant emerges from one and draws its supply of nourishment from the other, called the *cotyledon.* Some plants have but one cotyledon; others have two or more.

The oxygen, heat and moisture necessary for germination vary for different species, and to some extent within the same species. Indian corn will not germinate in a temperature below 48° F. nor above 115.2° F., while about 98° is the temperature that secures the most favorable results. Wheat has a range extending from 41° to 108.5°, with about 84° as the most favorable temperature.

The bean and squash afford good examples of one type of germination for seeds having two cotyledons. In the bean the nourishment is stored in the cotyledons in such a way that these appear above ground with but slight changes in form or color. As the nourishment is absorbed these leaves wither and fall; in the meantime the first pair of true leaves has developed and the root has taken hold on the soil, so that the plant is prepared to obtain its nourishment from the earth and air.

The pea represents another type of dicotyledonous seeds. Here the cotyledons are so full of nourishment that they cannot appear as leaves at all; they consequently remain in the ground while their nourishment is absorbed. In this type of germination, the first leaf that appears is a true leaf of the plant.

PEA AND CORN

Indian corn affords a good illustration of germination with only one cotyledon. In this case the nourishment is stored at one end of the seed, the large end of the kernel; it is absorbed while the seed remains under ground, as in case of the pea, and the first leaf appearing is a true leaf of the plant.

The food of a plant is stored in the seed in the form of starch and albumen, both of which are insoluble. Before these substances can be available for nourishment they must be changed into soluble compounds. When the seed is planted, it absorbs moisture and swells; fermentation sets in, oxygen is absorbed and the starch is changed to sugar and dextrin, both of which are soluble. These chemical changes are accompanied with a rise of temperature. After a few days the seed bursts open and the sprout or plumule appears. This is frequently called the radicle, though it is not the root. The direction of the plumule is at first downward, but it soon bends upward, and at the point of curvature it sends out a second shoot, which forms the rootlet.

BEAN

GERMS, *jurmz,* minute vegetable organisms which are responsible for all infectious diseases. In popular language the term is used in the same sense as bacteria.

Related Articles. Consult the following titles for additional information:

Bacteria and Bacteriology
Disease
Diseases of Plants
Germ Theory of Disease

GERM THEORY OF DISEASE, the theory that certain diseases are communicated from an infected person to an uninfected one by living organisms which gain access to the body of the afflicted person by the air, food or drink, and which, growing and multiplying in the body they invade, produce changes characteristic of special diseases. The period during which the organisms retain their vitality, like the rate of their growth and multiplication, varies in different cases, but it is limited in all. Few, if any, resist the destructive influence of a temperature of 300° F., while most succumb at the temperature of 200° or even less, particularly if exposed for some time. The living organisms, known as bacteria, microbes, micro-organisms or germs, are divided into several classes.

Doctor Koch, of Berlin, published in 1876 a paper giving a full account of the life history of the organism which had been observed in animals dead of splenic fever; and in 1877 the great French chemist Pasteur proceeded to investigate the subject, and his investigations conclusively support the germ theory of disease. In 1882 Doctor Koch announced the discovery of a micro-organism believed to be the chief, if not the only, cause of consumption of the lungs. These microbes are found not only in the lungs of persons who have died of tuberculosis, but also in the sputum of tubercular and consumptive patients, and they multiply by spores. Thus it is that the sputum of a consumptive patient, even after it has dried up, may be capable of imparting the disease, owing to spores being scattered in the air.

After the epidemic of cholera in Egypt in 1883, which spread to France and Italy, investigations were undertaken by French, German and British commissioners. Doctor Koch detected a peculiar bacillus, shaped like a comma (,), in the intestines of persons who had died of cholera, and he believed that this bacillus was the active agent in the production of the disease. In similar fashion diphtheria, lockjaw, pneumonia, typhoid fever and other diseases have been proved to be of bacterial origin. Hydrophobia, measles, scarlet fever, smallpox and whooping cough and other diseases are attributed to germs which have not yet been fully identified. Indeed, investigation shows that every infectious disease is due to some form of micro-organism, and that there is one particular organism for each particular disease. Each organism produces its own disease and none other; and the special disease cannot arise unless its germ has entered the body.

The channels through which these germs obtain entrance are innumerable, but they have one origin and one only, and that is a preceding case of disease. The "germ theory" affords the hope and suggestion of a method of diminishing, if not of eliminating such diseases altogether, and to some extent it also indicates the direction in which their cure is to be sought. If the particular microbe of each disease were known, the condition of its life and activity understood, there is great probability that its multiplication in the living body could be arrested and the disease could thus be cured. Even without such knowledge, however, the germ theory indicates that the means for arresting the spread of infectious diseases and diminishing their occurrence consist in preventing the spread of the germs from an existing case of disease.

Related Articles. Consult the following titles for additional information:

Antiseptic
Antitoxin
Bacteria and Bacteriology
Medicine (with list)
Sanitary Science
Serum Therapy
Surgery

GEROME, *zha rome′,* Jean Leon (1824-1904), a celebrated French painter and sculptor, born at Vesoul. After study at Paris he traveled in the East, where he obtained the material for most of his pictures. Many of his canvases are large, and all are faithful and scholarly representations of the phases of life they depict. Among the most famous are *Gladiators before Caesar, Slave Market at Rome, Cleopatra and Caesar* and *The Duel after the Ball.*

GERONIMO, *je ron′i mo* (?-1909), an Apache chief, who from 1884 to 1886 terrorized the settlers in New Mexico and Arizona. In the latter year General Crook with a force of regulars was sent against Geronimo's band. The terms of surrender were agreed upon, but before they could be carried out the Indians escaped. General Miles, who succeeded Crook, organized a vigorous campaign against the old chief; a detachment of troops captured him, and he was sent first to Fort Pickens, Fla., and later to Fort Sill, Okla.

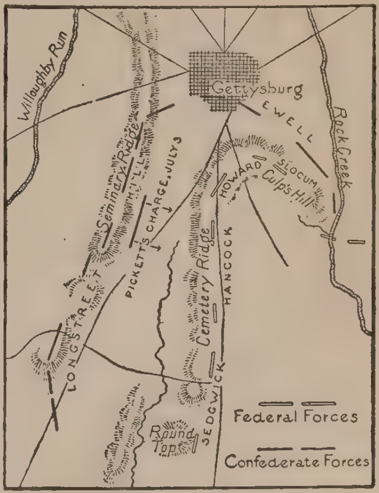
GER′RYMANDER, a word used in the United States to denote an unfair distribution of election districts within a state, to give advantage to a political party. The word was first used in 1812, when, under the administration of Governor Elbridge Gerry, the Republicans and Federalists being nearly equal in strength in Massachusetts, a redistribution of senatorial districts was made, so that those counties that returned large Federalist majorities were grouped together, thus reducing the representation of the Federalist party in the legislature. One district under the new law was so irregular in outline that it somewhat resembled a salamander, hence the name *gerrymander,* using the name of the governor in derision. This scheme for perpetuating the power of a political party has frequently been used since that time.

Elbridge Gerry (1744–1814), an American statesman, born in Marblehead, Mass. He was graduated at Harvard in 1765, and was a member of the Continental Congress of 1776.

Gerry was a delegate to the Constitutional Convention, but did not approve of the instrument and refused to sign it. In 1789 the Anti-Federalist party elected him to the First Congress. He was one of the envoys sent in 1797 to establish diplomatic relations with France. His colleagues, Marshall and Pinckney, being Federalists and out of sympathy with France, were ordered to quit France, but Gerry was permitted to remain; and he did remain, to the indignation of many Americans, until his recall was ordered. Elected governor of Massachusetts in 1810, Gerry, who was a keen partisan, took the lead in forming election districts from which the word *gerrymander* was derived. He was defeated in 1812, but his party elected him to the Vice-Presidency of the United States, in which office he died.

GETHSEMANE, *geth sem′a ne,* in Biblical literature, an olive grove near Jerusalem, a favorite resort of Christ and His disciples, and the scene of Jesus' agony on the night before His crucifixion. The spot which the travelers' guides to-day call Gethsemane is a walled enclosure 150 by 140 feet, containing eight very old olive trees, which by some are believed to have been there in the time of Christ.

GET′TYSBURG, Battle of, a decisive battle of the American Civil War, fought July 1–3, 1863, at Gettysburg, Pa., between the Federal army of the Potomac, numbering about 93,000 men, under General Meade, and the Confederate army of Northern Virginia, numbering about 80,000 men, under General Lee. On July 1, the two armies came together at the little village of Gettysburg, the Federals having closely followed



BATTLE OF GETTYSBURG

the Confederates in their advance northward from Fredericksburg. The Federals occupied a strong position on a line of bluffs south of the town; the Confederates formed their lines on a parallel ridge, about a mile distant. On July 2, the Confederates made a vigorous attack, drove back the Union left and gained a position on the right which seriously menaced the whole line. On the morning of the third, the Northern soldiers drove the Confederates out of this advanced position and repulsed a brilliant charge by Pickett's men against the center of the line on Cemetery Ridge. After this Lee was compelled to retreat across the Potomac. This battle marked a turning point in the Civil War. The total loss on the Federal side was 3072 killed, 14,497 wounded and 5434 captured or missing. The loss on the Confederate side was 2,592 killed, 12,709 wounded and 5,150 captured or missing. See CIVIL WAR IN AMERICA.

GETTYSBURG ADDRESS, a brief speech delivered by Abraham Lincoln on the occasion of the dedication of the National Cemetery on the field of Gettysburg, November 19, 1863. Although it contains but 267 words, it ranks as one of the world's masterpieces of oratory. The President did not expect to speak at the dedication; Edward Everett was to be the orator. When informed that he would be expected to follow Everett with a brief statement, it is said that he wrote his speech on the back of an envelope while on the train which carried him to the scene. It follows:

> Fourscore and seven years ago, our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated in the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this. But in a larger sense we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract. The world will little note, nor long remember, what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us,—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion,—that we here highly resolve that these dead shall not have died in vain,—that this nation, under God, shall have a new birth of freedom,—and that government of the people, by the people, for the people, shall not perish from the earth.

GEYSER, *gi'zur*, a spring which at intervals throws out quantities of hot water and steam. A geyser has a funnel-like opening, which extends to hot rocks below the surface. It was probably formed by the water which, when hot, dissolved the siliceous matter. The eruptions occur at intervals, being regular in some geysers and very irregular in others. They are usually more frequent in small than in large springs. Various theories have been advanced to account for the eruption, but all agree that it is caused by steam, the difference in theories being as to the way in which the steam acts. It is altogether probable that as the opening fills with water and becomes closed, the pressure causes the water at the bottom to become hot far above the boiling point (which see) at the surface. The temperature continues to increase until finally a small portion of steam escapes and forces some of the water out of the funnel. This in a measure relieves the pressure and the high temperature of the water causes it instantly to be converted into steam, which forces the water out through the funnel, often throwing it to the height of two hundred feet or more. The duration of an eruption varies from a few minutes in a small geyser to some hours in the largest. The water holds siliceous matter and carbonate of lime, which it deposits about the crater, making beautiful and fantastic formations, varying in color from white to blue and yellow.

The geyser regions of the world are found in Iceland, New Zealand, and in and about Yellowstone National Park in the United States. The last is by far the most remarkable and the most widely known. In 1904 a new geyser made its appearance in New Zealand, which is claimed to be larger than any other in the world. For a description of the geyser region of the Yellowstone, see YELLOWSTONE NATIONAL PARK.

GHATS, *gahts*, or **GHAUTS**, *gawtz*, two ranges of mountains in the peninsular portion of British India. They extend parallel with the east and west coasts. The general elevation of the Western Ghats varies from 4,000 to 7,000 feet. They form a watershed, and the rain collected on the eastern slopes makes its way across India to the Bay of Bengal. The Eastern Ghats have an average height of 1,500 feet and extend for a distance of 500 miles.

GHEBERS, *ge'burz,* or **GABERS,** *ga'burz,* a name given to the fire worshipers of Persia, represented in India by the Parsees (which see). The original Ghebers or followers of Zoroaster are now represented almost solely by the few who inhabit the cities of Yezd and Kirman and the adjoining villages. Among the leading practices of the Ghebers may be mentioned their refusal to contract marriages with those of other creeds and their objection to eating beef or pork or to partaking of anything cooked by one of another religion.

GHENT, *gent* (pronounced gông in Europe), BELGIUM, capital of the province of East Flanders. It is situated in a fertile plain at the junction of the Lys and Scheldt rivers, thirty-one miles northwest of Brussels. The city is divided by canals into a number of islands, connected with one another by bridges. Among the notable buildings are the Cathedral of Saint Bavon; the Church of Saint Nicholas (begun in the tenth century); the Church of Saint Michael; the university, a handsome modern structure with a library of about 100,000 volumes and 700 manuscripts; the Hôtel-de-Ville; the townhall; the Palace of Justice, and the Institute of Sciences. It also has many parks, gardens and promenades.

Previous to the World War Ghent was widely known as a center for the production of cotton and linen goods and lace, though it had declined somewhat from its former prosperity. Other industries of importance were sugar refining and the making of hosiery, thread, ribbons, instruments in steel, carriages, paper, hats and delft ware, and the raising and exportation of flowers. Ghent was founded before the seventh century, was fortified by Baldwin, first Count of Flanders, in the ninth century, and took a prominent part in European history, especially in the struggle for religious and political liberty. In 1792 the Netherlands fell under the power of France, and Ghent became the capital of the Department of Escaut (Scheldt). In 1814 it became, along with Flanders, part of the Netherlands, till the separation of Belgium and Holland. The treaty which ended the War of 1812 was signed here.

Though the city was occupied by the Germans early in the World War, it escaped bombardment, as no resistance was offered the invaders. In 1918 it was evacuated by the invaders, and restored to Belgium. Population, 1920, 165,910.

GHENT, TREATY OF, a treaty between the United States and Great Britain, at the end of the War of 1812, signed December 24, 1814, and ratified February 17, 1815. It restored all territory to its ante-bellum owners, except certain islands, provided for commissions to settle boundaries, and bound both parties to attempt the abolition of the slave trade. It failed, however, to dispose of the chief causes of the war, the impressment of American seaman, the fishing by Americans in Newfoundland waters and the rights of neutrals.

One of the great battles of the war, the Battle of New Orleans, was fought after the treaty was signed and before news of the event reached America.

Related Articles. Consult the following titles for additional information:

Impressment of Seamen	War of 1812
New Orleans, Battle of	World War

GHETTO, *get'o,* the Jewish quarter of a large city. In the Middle Ages the Jews living in towns and cities were assigned to separate quarters, outside of which they were not permitted to take up residence. The name Ghetto was applied to these sections, and is used to-day to designate any large section occupied almost exclusively by Jews of the poorer classes.

GHIBELLINES, *gib'el linz.* See GUELPHS AND GHIBELLINES.

GHIBERTI, *ge bair'te,* LORENZO (1378–1455), an Italian goldsmith and sculptor, born at Florence, where most of his best work, including frescos, painted glass and bas-relief, may to-day be seen. In 1401 the society of merchants at Florence invited artists to propose models for the bronze doors of the baptistry of San Giovanni. The judges selected the works of Brunelleschi and Ghiberti, but Brunelleschi withdrew. After twenty-one years' labor Ghiberti completed the doors, which Michelangelo said were worthy to adorn the entrance of paradise. The first door consists of twenty-eight panels, representing the life of Christ, the fathers of the Church and the evangelists. Ghiberti was afterwards commissioned to design the east doors, which he embellished with scenes from the Old Testament, severally called *Creation of Adam, Creation of Eve, Fall of Man, Expulsion from Paradise* and *Moses upon Sinai.*

GHOSTS. A belief in the return of the dead in the visible form of wraiths has been common to many races from the very earliest times. It has had an important part in some so-called religious beliefs and has led to the development of various religious theories, such as ancestor worship, belief in immortality, witchcraft, nature worship and totemism.

The origin of belief in ghosts is difficult to trace. The idea of the separation of the soul and the body may have developed through the phenomena of dreams, in which the mind, or soul, seems to leave the body and have independent experiences. Ghosts, it is declared, assume in course of development a terrible character. Unhindered by natural laws, they are able to compass instantly the distance between places far apart. These beliefs eventually led to the notion that ghosts possess remarkable superhuman powers, and among the superstitious great care is exercised to gain the good will of departed spirits to prevent them from exerting a malignant influence upon the living. Special fear is felt for the spirit of one who died a violent death or had been concerned with murder. This feeling still survives among primitive minds, conspicuous examples being exhibited in wild stories of haunted houses. No person of intelligence admits the possibility of such things.

Related Articles. Consult the following titles for additional information:

Ancestor Worship
Totem
Witchcraft

GIANTS, *ji'ants,* people of extraordinary stature. Taking the human race as a whole, the average height of the adult male is about five feet five inches. Each race, however has an average height of its own, which changes little from generation to generation and which often varies considerably from the general average of all men. Thus, the difference between the extremes, the Scotch (sixty-nine and five-tenths inches) and the Batwas of Africa (fifty-one inches) is over eighteen inches.

Notable deviations from the medium height are not at all uncommon, especially among the Teutonic peoples. The following are among authentic instances, ancient and modern, of persons who attained to the stature of giants: the Roman emperor Maximinus, a Thracian, nearly nine feet in height; Patrick Cotter (1761–1804), ninety-nine inches; Anna Swan, a native of Nova Scotia, above eight feet high; her husband, Captain Bates, a native of Kentucky, of the same height; Chang-wu-gon, the Chinese giant, seven feet nine inches high. Probably the tallest man whose size is definitely recorded is a certain Finlander who reached the height of nine feet four inches. Gigantic stature is generally accompanied by a want of proportion in parts, some parts growing too quickly for others, or continuing to grow after the others have ceased. The relation between the upper and lower half of the body is not disturbed, but the skull, brain and forehead are relatively small, the jaws very large, the shoulders, breast and haunches very broad and the muscular system comparatively weak.

GIANT IN BATTLE WITH ARTEMIS
From a relief in the Vatican, Rome.

The giants of Greek and Norse mythology were, of course, merely symbols, representing benignant or hostile forces of nature. Sometimes by the Greeks the term *giant* was applied to a man of great strength, even if he were not of gigantic size.

GIANTS' CAUSEWAY, *kawz'wa,* a remarkable natural promontory, projecting from the north coast of County Antrim, Ireland. It is formed by a mass of basalt from 300 to 500 feet in thickness. The causeway extends for about 300 yards and is formed of the tops of about 40,000 closely fitting basaltic columns. The diameter of the columns varies from fifteen to twenty inches. The entire structure is divided into three causeways, known as the Little Causeway, the Middle Causeway, or Honeycomb, and the Grand Causeway. In the Middle Causeway an arrangement of columns forms a chair, known as the Wishing Chair. Another arrangement of columns forms what is called the Giants' Loom, and still another, the Giants' Well, and another the Lady's Fan. The promontory takes its name from an ancient legend which attributed its construction to giants, who commenced to build a road across the channel to Scotland.

GIB′BON, a tailless monkey, found in the islands of the Indian Archipelago. It has a slender body and extraordinarily long arms, which, when the animal is standing, reach nearly to its ankles and which enable it to swing itself from tree to tree with wonderul agility. Its color is black, but its face is surrounded with a white or gray beard. Among the species are the lar, the white-handed gibbon, the wow-wow and the hoolock. See APE.

GIBBON

GIB′BON, EDWARD (1737–1794), an eminent English historian, born at Putney, in Surrey. He entered Magdalen College, Oxford, but was expelled at the end of fourteen months because of his conversion to Roman Catholicism. His father then placed him under the care of a Calvinistic minister at Lausanne, by whom he was reconverted to the Protestant faith. In 1758, after his return to England, appeared his first publication, *An Essay upon the Study of Literature.* In 1764 he visited Italy, and there the idea occurred to him of writing a great history, which became *The Decline and Fall of the Roman Empire.* The first volume was published in 1776, and his reputation was established at once. A complete edition of the history was published in 1783. Gibbon's history shows not only the remarkable breadth of his knowledge and attainments, but a great power of organization. As an authority on the period from the reign of Trajan to the fall of Constantinople, Gibbon's work is still unassailed, although in his skeptical attitude toward Christianity he has not given due prominence to the work accomplished by its spread.

GIBBONS, JAMES (1834–1921), an American Roman Catholic cardinal, born in Baltimore, and educated for the priesthood at Saint Charles' College and Saint Mary's Seminary in Maryland. He was ordained a priest in 1861 and thereafter served as priest of Saint Patrick's Church, Baltimore, and in Saint Bridget's Church, Canton, near Baltimore. After acting as secretary to Archbishop Spalding, he was made chancellor of the archdiocese and later assistant chancellor of the plenary council which met in Baltimore. In 1868 he was made bishop of North Carolina and four years later, bishop of the see of Richmond. On the death of Archbishop Bailey, whose coadjutor he had been, Gibbons became head of the see of Baltimore, and thus he became the head of the Roman Catholic Church in North America. In 1886 Gibbons was created a cardinal by Leo XIII. He has written *The Faith of Our Fathers, Our Christian Heritage* and *The Ambassador of Christ.*

CARDINAL GIBBONS

Cardinal Gibbons was not only the best-known of American Roman Catholics, but his leadership brought to him a power which was recognized outside the Church.

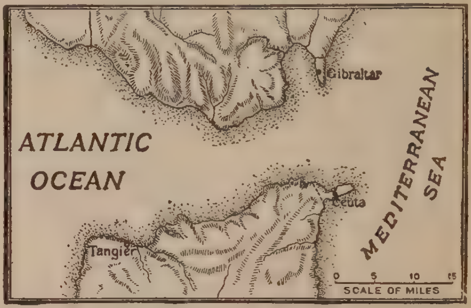
GIBRALTAR, *jib rawl′tur,* the world's strongest natural fortress, situated at the Atlantic entrance to the Mediterranean Sea. Its formidable character has passed into a proverb; the phrase, "as strong as Gibraltar," leaves nothing to be added.

There is here a mighty rock promontory, and at its base is the town of Gibraltar. Great Britain owns the rock; back of it is a strip of neutral territory one and one-half miles long and nearly a mile wide, and behind this lies the mainland of Spain. The highest point of the rock, which is of gray marble, is about 1,400 feet above sea level; its north face is almost perpendicular, while its east side exhibits tremendous precipices. On its south side it is almost inaccessible, making approach from seaward impossible; the west side, although very rugged and precipitous, slopes toward the sea; and here the rock is protected by powerful batteries, rendering it apparently impregnable. Numerous caverns and galleries, extending two to three miles in length and of sufficient width for carriages, have been cut in the solid rock, with portholes at intervals of twelve yards, bearing upon the neutral ground and the bay and mounted with more than 1,000 guns of the largest size and finest pattern. The peace-time garrison numbers about 5,000.

The town of Gibraltar is situated on the west side of the peninsula, terminating in Europa Point, and thus it fronts the bay. It consists chiefly of one spacious street, about a mile in length. Gibraltar is a free port and has a considerable shipping trade. The chief export is wine. The administration is vested in the governor, who is also commander in chief of the troops. The civil population was 19,120 in 1911.

Gibraltar, known to the Greeks as Calpe, was one of the famous "pillars of Hercules" (see Hercules, Pillars of). It was first fortified as a strategic point by the Saracen leader, Tarik ibn Ziyad, in 711, from whom it was thenceforward called the "Rock of Tarik." It was ultimately captured by the Spaniards from the Moors in 1462, fortified in the European style and much strengthened. It was taken, however, in 1704 by a combined English and Dutch force, and was secured to Britain by the Peace of Utrecht in 1713. In 1779 a siege was begun by Spanish and French forces; it lasted till 1783, but failed.

GIBRALTAR, Strait of, the channel which forms an entrance from the Atlantic into the Mediterranean. The narrowest part is a little to the west of Gibraltar, and is fifteen miles wide. A strong and constant current flows into the Mediterranean from the Atlantic Ocean, in the middle of the strait, but the under current, as well as two feeble lateral currents along the coast, set toward the ocean.



GIBSON, Charles Dana (1867–), an American illustrator, born at Roxbury, Mass. He studied at the Art Students' League in New York and in 1886 began to draw for periodicals. Later he studied in Paris, London and Munich. He created the type of feminine beauty known as the "Gibson girl," which has enjoyed a wider popularity than any other single type in American magazine illustration. Mr. Gibson has published several volumes of clever illustrations depicting society types. In 1920 he purchased the illustrated weekly, *Life*. Among his published works are the *Education of Mr. Pipp, A Widow and Her Friends, The Social Ladder, London as Seen by C. D. Gibson* and *People of Dickens.*

GIDEON, *gid′e un,* a Bible character who figures in a stirring and picturesque tale of the Old Testament. Called by God to deliver the Israelites from the Midianites, he led to battle 300 picked men, each of whom was armed with a sword, a trumpet and an earthen pitcher containing a lamp (see *Judges* VII, 19). Later Gideon was made the fifth judge of Israel. *Gideon's Band* is the name adopted by a religious organization of traveling men, founded in 1899 at Boscobel, Wis. Through their efforts Bibles have been placed in the guest rooms of hotels throughout the United States and in parts of Canada and England.

GILA, *he'lah,* a North American river which rises in the Sierra Madre Mountains in New Mexico and flows westward for about 500 miles, uniting with the Colorado. Curious ruins of stone-built houses of a former age occur all along its banks. See CLIFF-DWELLERS.

GILA MONSTER, a poisonous lizard of New Mexico, Arizona and Texas, and one of the largest lizards in North America. It is a repulsive animal, usually about a foot in length, though often larger, with a fat tail and short, weak legs. Its scales are brilliant orange and jet black. It has grooved teeth and highly developed salivary glands at their bases. The bite of the animal brings quick death to small mammals and birds, and is very serious, though seldom fatal, to man.

GILBERT, HUMPHREY, Sir (1539–1583), an English navigator and explorer. He was a man of liberal education and attained distinction in the English army during several campaigns. He became interested in the search for a route to India and in 1578 received a commission from Queen Elizabeth to conduct an expedition. His first adventure met with mishap, but after a few years a second expedition, in which both Raleigh and Gilbert were interested and which was under Gilbert's personal command, sailed for America. He planted a colony near Saint Johns, Newfoundland, but it proved a failure, and after a few weeks Gilbert set out for England. He encountered a storm, in which he perished.

GILBERT, WILLIAM SCHWENCK (1836–1911), an English playwright, best known for librettos written in collaboration with Sir Arthur Sullivan, the composer. He was graduated from London University and from there went into government work. His leisure moments were spent in writing comic verses and plays. His work with Sullivan dates from 1875. Their most famous musical comedies are *Pinafore, The Pirates of Penzance* and *The Mikado,* all of which have been tremendously popular. *Pinafore* has been given in nearly every civilized country; at one time ninety companies throughout the United States were producing it. *The Mikado* was equally popular. The Gilbert and Sullivan partnership continued until the death of the latter in 1900.

GILDING, the art of covering a surface with a thin layer of gold for the purpose of ornamentation. There are several methods of applying gold, depending upon the surface to be covered. In general they may be designated as *chemical* and *mechanical* gilding.

Chemical gilding embraces those processes in which the gold is at some stage in a state of chemical combination. It is in some cases applied cold; some applications require heat. Cold gilding is used for gilding metals, wood and other surfaces which cannot stand a high degree of heat; also for gold plating. The processes are long and complex. Gilding requiring heat is used in the decoration of pottery and porcelain. The beautiful pure gold, such as that used on table china is prepared by pulverizing it, then mixing it with oxide of bismuth, borax and gum water. It is applied like paint, with a camel's hair brush, and the decorated article is then put into a kiln and burned for several hours at high temperatures.

Mechanical gilding consists of applying gold leaf directly to a surface, such as masonry, wood or ivory, which has been prepared with a size. The gold leaf is placed on the size while the latter is damp, so it will adhere. In this process various substitutes for gold are frequently employed. The leaf is cut in small pieces and carefully applied to the surface specially treated to receive it, by means of special tools. It is then brushed to remove particles of dust or fragments, and is then varnished.

The art of gilding is very old. It was known to the ancient Egyptians, Persians, Greeks and Romans, who used it extensively for architectural ornament and for interior decoration. Two conspicuous modern examples of architectural gilding are in Saint Peter's Cathedral, Rome, and in the Congressional Library at Washington, D. C. Numerous domes of public buildings in America and Europe are covered with gold leaf.

GIL'EAD, a mountainous region east of the River Jordan, granted to the tribes of Gad and Reuben and a part of the tribe of Manasseh, when the Israelites took possession of the Promised Land (see *Numbers* XXI, 21). During all the history of the Israelites, Gilead was a sort of land of asylum, to which those who were not in harmony with the government could flee. It was the refuge for Absalom when he fled from his father, and during Absalom's rebellion it served David for a similar purpose. It was the home of Elijah and Saul, and Saul with his sons was buried there. The familiar expression "Is there no balm in Gilead?" means "Is there no place of refuge?" See PALESTINE.

GILLETT, *gil et′,* FREDERICK HUNTINGTON (1851–), an American congressman, elected Speaker of the House of Representatives in 1919, by the Republican majority, on the organization of the Sixty-sixth Congress. He was born at Westfield, Mass., and was graduated at Amherst College in 1874. In 1877 he received the degree of LL.B. at Harvard, and the same year opened a law office at Springfield, Mass. From 1879 to 1882 he was assistant attorney-general of Massachusetts, and later served in the state house of representatives. In 1893 he took his seat in the national House of Representatives, in which he has since served continuously.

GILLETTE, WILLIAM HOOKER (1855–), one of the leading figures on the American stage, and a gifted playwright. He was born in Hartford, Conn., was given an academic education, and while playing in stock companies in New York and Boston took special university courses. His theatrical career began in 1877, and his productivity as a dramatist has been almost co-extensive with his stage experiences. His earlier plays, *The Private Secretary, Esmeralda* and *Because She Loved Him So,* were deservedly popular. *Secret Service* and *Held by the Enemy* are considered the best plays on the theme of the Civil War that have been written. One of Mr. Gillette's chief successes came with the production of a play which he dramatized from Sir Arthur Conan Doyle's stories of "Sherlock Holmes."

GILLS, the breathing organs of animals which obtain their oxygen from water. In fishes, the gills consist of cartilaginous or bony arches, attached to the bones of the head and furnished on the outer, convex sides with a multitude of fringed, vascular fibers, resembling plumes. When healthy, these are of a red color. The water is admitted by gill-openings, and as it circulates through the plumelike parts of the gills, the oxygen is extracted from it. The crustaceans, the mollusks and the amphibians in certain portions of their lives are furnished with gills. See FISH.

GILMAN, DANIEL COIT (1831–1908), a distinguished American educator, was born at Norwich, Conn., educated at Yale University and made professor of physical and political geography in that institution. He held the position until 1872, when he became president of the University of California. From 1875 until 1901 he was president of Johns Hopkins University. On the establishment of the Carnegie Institution in the latter year Dr. Gilman became president and served two years. He was president of the American Oriental Society and a member of the British Association and of several other similar organizations of high rank.

GIN, *jin,* a spirit distilled from grain and usually flavored with juniper berries. It is largely manufactured in Holland. A low-grade spirit sold under the name of gin consists of diluted alcohol flavored with salt and oil of turpentine; this is often called "nigger gin" in the Southern states of the American Union.

GINGER, *jin′jur,* a plant that grows in moist places in various parts of tropical Asia and neighboring islands and which has been introduced into the West Indies (particularly Jamaica), South America and West Africa. It is a reed-plant with white, purple-streaked flowers and knotty rootstocks. From these rootstocks is obtained the ginger of commerce.

THE GINGER PLANT

GINGHAM, *ging′-am,* a summer fabric widely used as a material for children's and women's dresses and aprons. Gingham differs from calico in having the colors woven with the fabric, not printed on it. The patterns are various—sometimes in fancy designs, sometimes checkered, often striped. Originally ginghams were made only from cotton, but cotton and silk or silk and ramie are now used in making fancy weaves. The people of the United States are constant buyers of gingham, and the country manufactures about 550,000,000 yards annually.

GINKGO, *jink'go,* a Japanese tree, often cultivated in the United States on account of it beautiful foliage, which has the appearance of maidenhair fern. In China and Japan the tree was once regarded as sacred, and was planted in the temple gardens.

GINSENG, *jin'seng,* the yellowish root of a low herb belonging to the same family as the wild sarsaparilla. In China ginseng is valued as a remedy for sickness, and the people of that country import large quantities from the United States, where ginseng cultivation is a profitable business. The roots have been sold for as much as ten dollars a pound. The name comes from the Chinese for *likeness of a man,* for some of the roots bear a fancied resemblance to a human being. Superstitious Chinese will pay extra prices for roots of such form.

The plant grows wild in America from the mountains of Georgia to the Saint Lawrence Valley, and as far west as the Mississippi. Both wild and cultivated ginseng is gathered for export, but the cultivated varieties bring the best prices. The plant does well in a loose, well-drained soil containing humus, potash and phosphoric acid. Plants grown in the open need a lattice-work covering to protect them from the sun's heat. As it takes six years for the plant to reach maturity, the grower must expect to wait for returns on his investment.

GIORGIONE, *jawr joh'na,* (1477–1511), whose real name was GIORGIO BARBARELLI, was one of the greatest painters of the Italian Renaissance. He grew up in Venice, where he became a pupil of Giovanni Bellini and identified wtih the Venetian School. His position in Venetian art is analogous to that of Leonardo in Florentine painting. With both the picture represented an idea, and detail was subordinated to general effect. Giorgione's pictures rarely tell a story, but embody a mood and make their appeal through beauty alone. His art expressed all the charm, the grace, the splendor of the Venice of his day. Of the 150 pictures attributed to him, only a few are unquestionably from his hand. These are an altar piece in the Cathedral of Castelfranco, *The Family of Giorgione* (Venice), *The Concert* (Pitti Palace), *Christ Bearing the Cross* (owned by Mrs. Gardner of Boston), and the *Sleeping Venus,* the last considered the most chaste representation of Venus in the art of the Italian Renaissance.

GIOTTO, *jot'to,* or **AMBROGIO DI BONDONI** (1266–1337), one of the most celebrated figures in Italian art. He was born at Vespignano, a village near Florence, at a time when the art spirit after its long sleep through the Middle Ages was beginning to awaken. For hundreds of years before Giotto art had been stiff and formal; human figures bore little resemblance to life. Giotto's great work was to make his representations naturalistic. He tried to paint his human figures lifelike, his draperies graceful and realistic, his landscapes true to nature; to draw his architectural details in proper perspective, and to improve color. His pictures appear almost childish compared with those of the great masters, such as Raphael; but he has been held in veneration by every painter since his day, by reason of his contributions to the development of the art of painting.

Despite its technical deficiencies, Giotto's art possesses one quality in which it is surpassed by few artists of later times, that of dramatic significance. This is conspicuous in his frescoes representing the life of Saint Francis, at Assisi, in the four allegorical frescoes in honor of Saint Francis, in his scenes from the life of Christ, in his frescoes in the Chapel of the Arena, Padua, and at Rome. Giotto was not only a painter, but an architect of note. He prepared the plans for the beautiful Campanile of Florence known as "Giotto's Tower."

GIPSY. See GYPSIES.

GIRAFFE, *ji raf'* or **CAMELOPARD,** *ka mel'o pard,* a remarkable animal inhabiting Africa, the only species of its genus and family. It is the tallest of all animals, a full-grown male reaching the height of eighteen to twenty

GIRAFFE

feet. This great stature is mainly due to the extraordinary length of the neck, in which however, there are but seven vertebrae. The animal has on its head two bony projections resembling horns. Because of its height it can easily feed on the leaves of trees, and in this it is further aided by its tongue, which is long and can be thrust far out of its mouth and curled about the twigs and leaves. When it browses on grass, to get its mouth down to the ground it has to stretch its fore legs far apart, a grotesque spectacle hugely enjoyed by children when watching the animal feeding in a "zoo." Its color is usually light fawn, marked with darker spots. The giraffe is a mild, inoffensive animal, and in captivity it is gentle and playful. The name *camelopard* is a combination of *camel* and *leopard,* for the giraffe is shaped something like a camel and is spotted like a leopard. However, this name is seldom applied to the animal, except in scientific circles.

GIRARD, *ji rard',* **COLLEGE,** a college established in Philadelphia in 1848, under provisions made in the will of Stephen Girard (see below). It was originally instituted for the education of poor white orphan boys, and to-day it exists primarily as a school for training boys to earn their living. There are three divisions—the primary school of four years, the grammar school of three years, and the high school of four years. Instruction is given in all the mechanical trades, and in bookkeeping, typewriting and other commercial branches. The endowment fund has been increased to $29,000,000, and there are twenty buildings on the forty-acre campus. The school has a capacity of 1,520 pupils. A peculiar provision of the will prevents any ecclesiastic, missionary or minister from having connection with the college, and clergymen are not even allowed to enter the grounds. This was to keep the boys' minds free from denominational controversies. There is, however, daily chapel service.

Stephen Girard (1750–1831) was born at Bordeaux, France. When but thirteen years old he became a sailor, and in 1773 he was already master and captain of a vessel operating between New York, New Orleans and the West Indies. In 1777 he began his mercantile career in Philadelphia. He was heavily interested in the first United States Bank, and upon the lapse of its charter he bought most of its stock and its building and instituted the Girard bank. During the War of 1812 he placed its resources at the disposal of the government.

GIRASOL, *jir' o sahl,* a precious stone that reflects, apparently from its interior, bright red or yellow light. The name has been given to fire opal and to star sapphire. Girasols were once highly esteemed; now that they are made artificially they are not so popular.

GIRL SCOUTS, an organization for girls, similar in purpose to the Boy Scouts (which see). It is national in scope, with headquarters in New York City. The motto of the Girl Scouts is, "Be Prepared;" the slogan, "Do a Good Turn Daily." Each member promises, on her honor, that she will try to do her duty to God and her Country; to help other people at all times; to obey the Scout laws.

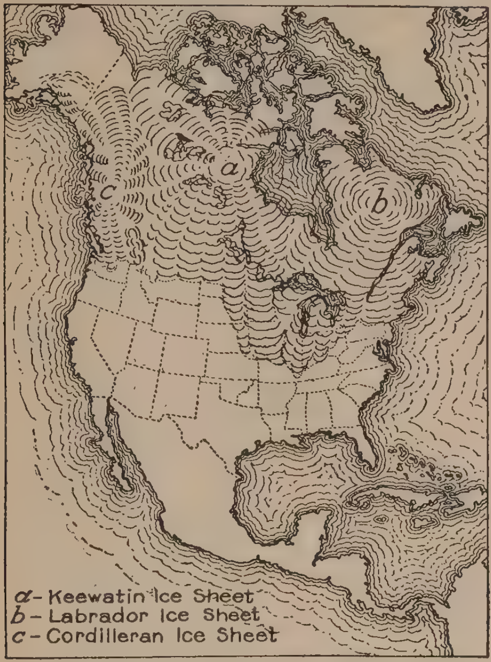
GIRONDISTS, *zhe roN' dists* (from *Gironde,* a department of France), one of the great political parties of the French Revolution. The Girondists were moderate republicans, but were distinguished for visionary ideals, rather than for a well-defined policy; hence, they fell an easy prey to the more radical Jacobins. They were overthrown in June, 1793.

GIZ'ZARD, a digestive organ found in birds, certain insects, the earthworm and the crayfish. The gizzard of birds makes up for their lack of teeth. It is a muscular bag having a thick, membranous lining, and is located in the stomach. When the food has been moistened and softened in the bird's crop, it passes to the stomach to be mixed with gastric juice. It then goes into the gizzard, the thick walls of which crush it to a pulp, being assisted by gravel swallowed by the bird. The most powerful gizzards are found in birds that eat grains.

GLACE BAY, a town in Cape Breton county, Nova Scotia, fourteen miles from Sydney. The Dominion Coal Company, which has large mines here, has an average pay roll of $500,000 a month. Fishing and the manufacture of machines are important industries. It is an important wireless telegraph station. Population, 1911, 16,562.

GLACIAL, *gla' shal,* **PERIOD,** or **AGE OF ICE,** a remarkable period of geologic time, during which portions of the earth were covered by immense ice sheets. This period is the connecting link between the present period and the one just preceding the Age of Ice. Whether man existed then is unknown, but it is believed that the Glacial Period directly preceded the Age of Man.

Extent. At least 4,000,000 square miles of North America were covered by ice sheets. The ice, in most places thousands of feet thick, extended over all of Canada, and covered all of New England, New York, Northern Pennsylvania, the eastern Mississippi Valley as far south as Ohio, Iowa, Minnesota, most of North Dakota, the northern part of Montana, Washington, the eastern parts of South Dakota and Nebraska, over half of Missouri and a part of Kansas. In Europe, Russia, the Low Countries, Germany, the Scandinavian Peninsula and the greater part of the British Isles were ice-covered, and there were small ice areas in Asia and South America.



GLACIAL FIELD IN NORTH AMERICA

The Record It Left. In the course of time the ice sheets began to move, the direction in each case being toward the lowest level. In the eastern part of the United States the general direction was to the southeast, while in the central portion it was to the southeast and southwest, showing a division in the ice sheet. In Canada the direction seems to have been toward the northeast. Wherever it existed the straight mass of ice in its movement leveled hills and mountains, filled up valleys and lake beds in some places and hollowed them out in others. The rocks over which it passed were worn smooth and were scratched by the movement of the boulders which were frozen into the glacier. The scratches thus made are known as *striae.* Some of these are large furrows, while others are mere scratches on the rock. The glacier carried with it large quantities of rock and other débris, which were deposited wherever it melted. This accounts for many of the boulders in the Mississippi Valley and in the eastern portion of the United States, which are of an entirely different character from the rock of the surrounding region.

Possible Causes. The cause of the Glacial Period is not well understood, and various theories have been advanced to account for it. Among these are that the sudden elevation of the northern continents caused such a change in temperature as to cover the region with the ice; another is that the change in atmospheric and oceanic currents caused such a heavy rainfall over the cold portions of these continents as to form the glacier; and a still later theory is that the change in climate was due to a change in the relative positions of the earth and sun.

Related Articles. Consult the following titles for additional information:

Age of Man
Drift
Erosion
Geology
Glacier
Moraine

GLACIER NATIONAL PARK, one of the most beautiful of the reservations in the United States, situated in Northwestern Montana, 447 miles from Yellowstone National Park. It extends to the international boundary, where it joins the Rocky Mountains Park, in Alberta. It was created a national park in 1910, and has an area of 1,534 square miles, nearly 300 square miles greater than that of Rhode Island.

As the name implies, the most striking feature of the park is its glaciers, of which there are between seventy and eighty, the largest nearly five square miles in extent. Other scenic beauties are plentiful, for there are steep cliffs, dashing mountain streams, dozens of waterfalls, and over 250 lakes, surrounded by wooded mountains or rocky walls. The streams, the lakes, and Flathead River, which borders the park on the west, abound in fish, and the wooded sections contain many wild animals. Numerous trips have been mapped out, and the park is becoming a favorite resort of tourists during the open season, from June 15 to October 1. See PARKS, NATIONAL.

GLACIERS, *gla′shurz,* icy masses of great bulk, resembling frozen torrents, which cover the summits and sides of mountains above the snow line. They are found in Switzerland, Scandinavia, the Andes, the Rocky Mountains in British Columbia, the United States and Alaska, and in the Himalayas. Glaciers have their origin in the higher valleys, where they are formed by the freezing and compression of masses of snow. The ice of glaciers differs from that produced by the freezing of still water, as it is composed of thin layers filled with air bubbles. It is likewise more brittle and less transparent.

Characteristics. The glaciers are continually moving downward, and not infrequently they reach the borders of cultivation. A glacier moves from eighteen to twenty-four inches in twenty-four hours. At its lower end the glacier is generally very steep and inaccessible. In its middle course it shows an undulating surface, broken up by fissures, or *crevasses.* As it descends, it experiences a gradual diminution, from the action of the sun and rain and from the heat of the earth; hence a phenomenon universally attendant on glaciers—the issue of a stream of ice-cold turbid water from the lower end. The descent of glaciers is shown by changes in the position of masses of rock at their sides and on their surface. As glaciers move they pile up *moraines,* consisting of accumulations of stones and gravel, along their sides and at their lower ends. These are composed of fragments of rock detached by the action of frost and other causes (see MORAINE.) The fissures or crevasses by which glaciers are traversed are sometimes more than 100 feet in depth, and since they are often covered with snow, they are exceedingly dangerous to travelers.

Famous Glaciers. One of the most famous glaciers of the Alps is the Mer de Glace, belonging to Mont Blanc, in the valley of Chamouni, about 5,700 feet above the level of the sea. However, in the chain of Monte Rosa the phenomena of glaciers are exhibited in their greatest sublimity, and in their most interesting phases from a scientific point of view. Glaciers exist in all zones in which mountains rise above the snowline. Those of Norway are well known and also those of Iceland and Spitzbergen. Hooker and other travelers have given accounts of those of the Himalayas. Glaciers are conspicuous on the Andes, while the Southern Alps of New Zealand rival in this respect the Alpine regions of Switzerland.

The glaciers of Alaska are noted for their size and grandeur. They reach their greatest development along Glacier Bay and around Mount Fairweather, where, excepting those of polar regions, the largest glaciers of the world are found. Compared with these the glaciers of the Alps are mere rivulets. Among the most noted are the Malispena, on Yakutat Bay, 1,550 feet high, with an area of 600 square miles; the Valdez, in Prince William's Sound, fifteen miles long; the Muir, at the head of Glacier Bay, 200 feet high, with a frontage three miles long; and the Pacific Glacier, off Mount Fairweather. Extensive glaciers are also found around Cook's Inlet and along the Peninsula of Alaska. All of the valleys of the northern Alaskan coast are filled with ice rivers, and the fiords of this entire region have been formed by glacial action. In numerous instances the glaciers have plowed out gorges many feet below the level of the sea.

Why Glaciers Move. The downward movement of glaciers presents a problem to scientists. Though glacier ice is brittle, it descends in much the same way as a plastic substance, and like the parts of a river, its middle and upper parts move faster than the sides and bottom. One theory, called the *plastic* theory, supposes that ice is plastic to slow changes, though brittle under sharp, heavy blows. Therefore a huge glacier mass, forced downward by its own weight, can move at a very slow rate of speed without being smashed to fragments.

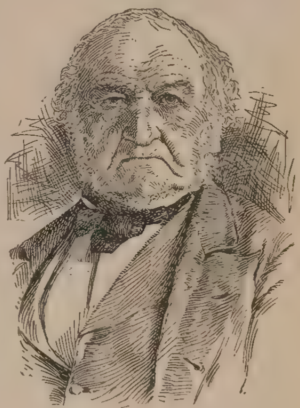
Prof. James Thomson of Glasgow has advanced the *pressure* and *regelation* theory. He showed that increase of pressure lowers the freezing point of ice, and pointed out that at any point where the pressure becomes greater than the average, the freezing point will be lowered and a little ice will melt; with the release of pressure at this point the ice will move slightly, and the pressure will be changed to other points. Wherever there is melting the water will be forced through cracks in the ice to other points of less pressure, and will there freeze. As this process is repeated many times the ice mass moves slowly along.

Related Articles. Consult the following titles for additional information:

Geology	Mer De Glace
Glacial Period	Muir Glacier

GLADIATOR, *glad'i a tor.* In ancient Rome a person who fought in the arena for the entertainment of spectators. There was a time when the combatants were captives, criminals or slaves. At a later period gladiatorial fighting became a sport of the participants, and freemen fought in the arena for hire or for glory. Schools for the training of gladiators were founded, and even women are said to have entered the lists. The only weapon was a short dagger, and the only protection a small shield. The contests were usually between two men, between a man and a beast or between parties of men. If a gladiator were overpowered the audience by pointing thumbs up or down indicated whether he was to be spared or killed. The combats were brutal in the extreme, but appealed strongly to the Romans, who enjoyed nothing more than the sight of bloodshed. It is said that Emperor Trajan gave one gladiatorial exhibition which lasted a hundred days, during which 2,000 men were killed. Such exhibitions were abolished by Theodoric in A. D. 500.

GLADIOLUS, *gla di'o lus,* a stately plant of the iris family, extensively cultivated for its tall, crisp spikes of showy blossoms, which are crimson, yellow, variegated or white. The long leaves are ribbed and sword-shaped, and cling to the base of the flowering stalk. The gladiolus is grown from a bulb called a corm. To insure continuous seasonal blooming, the corms should be planted at intervals of two or three weeks in March, April and May. The blossoms are ranged on one side of the spike; the flowerets, formerly little larger than daffodils, have become, under cultivation, deep chaliced, like an Easter lily, and half the size of that flower. The spray opens slowly, from below upward, and each day there are some fresh blossoms on the stem. The gladiolus fields on Long Island, N. Y., are the most famous in the world.



WILLIAM E. GLADSTONE

GLADSTONE, *glad'stun,* WILLIAM EWART (1809–1898), England's greatest statesman during the reign of Queen Victoria, four times Prime Minister and a pioneer in the struggle for Irish Home Rule. He was born in Liverpool, of Scotch ancestry, and was educated at Eton College and at Christ Church, Oxford. Gladstone first entered Parliament in 1832, and at that time was a Tory, but later he found his sympathies turning to the Liberals, and it was as a Liberal statesman that he won fame and honor. Elected to Parliament in 1847 for Oxford University, he made his first great speech in an attack on Disraeli's budget of 1852. In the following year he became Chancellor of the Exchequer under the Earl of Aberdeen, a post which he also held for a short time in 1855 under Lord Palmerston. In 1859 he again took office as Chancellor of the Exchequer under Lord Palmerston.

The budgets which Gladstone brought forward during the six years that followed were remarkable documents. At the general election of 1865 he was returned for South Lancashire, and in the same year he became

GLADIOLUS

the Liberal leader in the Commons in the Russell administration, still continuing to hold the post of Chancellor of the Exchequer. In 1867 a Reform Bill was brought forward, to the final shape of which Gladstone materially contributed. His advocacy of this measure shows his definite break with the Conservative party and his transition to the Liberals.

At the general election of 1868 Gladstone lost his seat for South Lancashire, but was returned by Greenwich. There being a great Liberal majority in the new Parliament, Gladstone became Premier. The next year he carried his bill for the disestablishment of the Irish Church, and in 1870 he passed his Irish Land Act. Parliament was dissolved in 1874, and the Conservatives succeeded to office. During Lord Beaconsfield's tenure of office, Gladstone denounced the Bulgarian atrocities, the Anglo-Turkish treaty and the Afghan War, and his speeches during his candidature for Midlothian greatly helped to render the government unpopular. In 1880 the general election reinstated him firmly in power. In 1882 two Irish reform acts were passed, and in 1883 measures relating to bankruptcy were carried. The bill extending household suffrage to the counties was next carried, but the Gladstone Ministry fell the following year.

In 1885 Salisbury resigned after an adverse vote in the Commons, and Gladstone again came into power. He soon startled the country by introducing a measure of Home Rule for Ireland (1886). As it failed to pass the Commons, an appeal was made to the country, the result of which was emphatically adverse to Gladstone's proposals, and he had to make way for Lord Salisbury. In 1892, however, the result was again reversed, and Gladstone once more resumed authority. He introduced another Home Rule bill, which was passed by the House of Commons, but rejected by the House of Lords. The aged Premier then retired to private life, but he had started movements that were to make England one of the most democratic countries in the world.

GLANCE, a name once applied to minerals with a lustre similar to that of metal. Some of the more important of these minerals are *glance coal,* which is *anthracite,* or hard coal; gold glance, which is gold or silver telluride; lead glance, or lead sulphide, and silver glance, or silver sulphide.

GLANDERS, *glan'derz,* a contagious disease afflicting horses, mules and asses and sometimes other domestic animals, though cattle, sheep and pigs are usually free from it. The disease is caused by a microbe and appears in different forms, though all animals afflicted with it usually present about the same characteristics. It is usually fatal, the animal dying in from eight days to three weeks. The chronic form, generally known as *farcy,* begins with the formation of little bunches or nodules under the skin, which terminate in ulcers. These ulcers occur usually on the neck and shoulders and inside the thighs. The disease affects the lungs and causes the nostrils to discharge a very offensive pus.

The spread of glanders is usually due to infection from the pus and other discharges of the afflicted animal. No remedy has been discovered, and when the disease appears the only means of preventing its spread is to kill the diseased animal and bury or burn the carcass, then thoroughly disinfect the stables and all articles with which the animal has been in contact.

GLANDS, organs whose specific function is to separate something from the blood. In structure a gland is a body of secreting cells, having a supporting basement membrane, a fine network of blood vessels, a nerve supply and a duct through which the secretion passes. *Simple tubular glands* are depressions of the mucous membrane, lined with secreting cells, as the glands of the stomach. Some bodies called glands have no duct, as the spleen and the thymus gland; the latter is situated in the front of the chest behind the sternum and partly in the lower part of the neck. It is largest in infants and gradually disappears in adult, or old, persons. It has been claimed that its function is the formation of colorless corpuscles. In hibernating animals it becomes enlarged and is laden with fat, as the time for the winter sleep approaches, and it may help to maintain the temperature and respiration of the body during the period of rest. The *thymus* of veal and lamb is called *neck sweetbread,* to distinguish it from the pancreas, or stomach sweetbread.

The *thyroid gland* lies in the throat below the larynx and when enlarged by disease gives rise to "Derbyshire neck," or goiter.

The *liver* is the largest gland of the body. In connection with the alimentary canal there are in the mouth, the two *parotid,* two *submaxillary,* two *sublingual,* and many *buccal* glands, whose function is to secrete saliva. The parotids are situated one in front of each ear and are the seat of the disease known as *mumps. Sebaceous glands* are abundant in those parts of the surface of the body supplied with hair; they are also situated about the entrances to the body, the nose, mouth and ear. These glands are absent from the palms of the hand and soles of the feet, and pour out an oily secretion which keeps the hair and skin soft. *Sudoriferous,* or sweat, glands are situated in all parts of the surface of the body and are especially abundant in the palms of the hands and soles of the feet.

Related Articles. Consult the following titles for additional information:

Goiter
Liver
Pancreas
Secretion
Skin
Spleen

GLAS'GOW, SCOTLAND, in 1921 the second city in size in the British Isles, being exceeded only by London. In 1917, owing to the military situation and munition manufacture, Glasgow forged rapidly ahead of Birmingham, its nearest rival. The city is the largest in Scotland, is situated on both banks of the River Clyde, and is famous for its age, its architectural beauty and its great university, founded in 1451. Population, 1921, 1,034,069.

The city is divided into east and west sections, the dividing line being Buchanan Street. In the east section is all that remains of the ancient Glasgow, around which has grown a portion of the modern city, particularly the public buildings section. The western part contains the modern and the more fashionable quarter. The main streets are for the most part parallel with the river, and cross streets are generally at right angles to these. This statement does not apply, however, to the oldest part of the town.

Argyle Street, the main business thoroughfare, parallels the river. George Square, the civic center, is adorned with a dozen fine statues, the most imposing being a great bronze figure of Sir Walter Scott, at the top of an 80-foot column. Around the square are a number of the most noted buildings, including the municipal building and the postoffice.

Glasgow is a vast manufacturing city, and it has the smoky skies of the average factory town; in other respects its attractions are manifold. Its manufacturing advantages are due to the location of the city not far from the mouth of the navigable Clyde, the possession of a fine harbor, and nearness to coal and iron fields. The river was widened and deepened at a cost of $42,000,000. The exports are chiefly cotton, linen and woolen goods, coal, paper, machinery and chemicals. Whisky has also been a famous export, for Scotch whisky is known throughout the world. As a ship-building center Glasgow for many years has led the world. The water supply for the city is secured from Loch Katrine, about forty miles distant and 365 feet above sea level.

Government. Glasgow has set an example in municipal reform which has been followed in many respects by other cities throughout the world. The city controls all its activities; there are no private companies in control of public service utilities. This is true of many other municipalities, but Glasgow exercises its official rights more broadly than most other towns. For example, the private yards of the citizens, as well as streets and alleys, are cleaned by the city, at slight expense to the householder; the public lodging houses (not hotels) are owned by the city; there are family homes, city controlled, in which working mothers can live very cheaply and cleanly, and leave their children during the day; the city's garbage is worked into commodities which return a profit. The street cars have been municipally owned since 1894. There are municipal markets, and all slaughtering is done under city control.

Education. The University of Glasgow has been mentioned above, and particular reference is directed to the article GLASGOW, UNIVERSITY OF, following. There is also the Glasgow and West of Scotland Technical College, Anderson College, the United Free Church College, Saint Mungo's College and Saint Margaret's College for Women, in addition to the usual means for free public education.

History. The city's traditional beginning has been traced to the year A. D. 560, or thereabouts, when Saint Kentigern, called the "apostle to the Scots," built a little wooden church on its site. Afterwards there was no development which became historical for over five hundred years. In the year 1116 the Prince of Cumbria, later King

David I, built a new church on the site of the first building and took steps which made certain the permanence of the settlement.

In 1300 William Wallace (which see) defeated the English here, and in 1305 in Glasgow he was betrayed to them. In 1636 the town became a free royal burgh. The assured prosperity of the city began soon after the union of Scotland and England in 1707.

GLASGOW, University of, one of the most celebrated universities of Great Britain, founded at Glasgow in 1451. By acts of Parliament in 1858 and 1889, the university was thoroughly reorganized and now exists on very much the same plan as the universities of Oxford and Cambridge. The corporation consists of a chancellor and rector, dean of faculties, principal, professors and students. The chancellor is chosen for life. The rector is chosen by the students every three years. The university maintains departments in the arts, science, medicine and surgery, theology and law. The enrollment is about 2,800 in normal years, including many who receive fellowships and scholarships. About one-fourth of the students are women. The library contains 210,000 volumes, and the university has connected with it a number of important museums and exhibits.

GLASS, a very useful transparent substance made by melting together under intense heat sand and various other ingredients. It would be difficult to conceive a civilized world without glass. It is the material used in making our window panes, a portion of our tableware, our medicine bottles, our mirrors and the lenses of our spectacles, and it is utilized constantly in the arts, in commerce, in science and in business.

Manufacture. Glass is made in factories especially constructed for the purpose. The most important part of the factory is the furnace. This may be circular, with a shelf running around next to the wall, or it may be rectangular, with the bottom sloping towards one end. In either case, the furnace is the base of a huge chimney. The fuel used is gas, and the furnace must be supplied with a strong draft, in order to insure the intense heat necessary to melt the materials. These are placed in pots, when circular furnaces are used, and the pots rest upon the shelf around the wall of the furnace. These pots are made of fire clay and are very carefully constructed. Each holds from 1,500 to 2,000 pounds of material. For the best quality of glass the pot is hooded and has an opening on the side of the hood, through which the material can be put in and the melted glass taken out. For cheaper varieties the pots are open at the top. In the tank furnace, the type used most generally in modern glass making, the material is thrown into the tank, where, as fast as it melts, it runs down the sloping bottom to the lower end of the tank, from which it is taken out, while the raw material is put in at the opposite end. The largest furnaces are seventy-five feet long, sixteen feet wide and five feet deep.

The kind and quality of the product depend upon the substances used. For a good quality, all of the raw material must be pure. Sand forms the basis of all varieties and is the most difficult substance from which to separate the impurities. Animal and vegetable impurities, are removed by burning. Of mineral impurities, iron is the most objectionable, since it discolors the glass, and, except for the poorest qualities, makes the sand worthless. Sand used for colorless glass may not contain over one-half of one per cent of iron. Various other materials are added, according to the grade of glass desired and the purpose for which it is to be used. Lime is a common constituent, but it must be used with discrimination, as too much of it makes the glass brittle. Lead oxide is used in making varieties with a high degree of luster and transparency. Potash-lime glass is very hard and not easily melted. Other ingredients used include manganese, cobalt, copper, zinc, tin, arsenic and saltpeter besides pigments for coloring.

Preparation of Material. The ingredients are ground to a fine powder and thoroughly mixed in proper proportions, forming what is called the *batch.* To this a small quantity of broken glass, or *cullet,* is added to assist in melting. In pot furnaces it requires about twenty-four hours for the glass to melt and become clear. When this has been done the fire is lowered, and the glass is taken out and worked. In tank furnaces the material is constantly being added and the glass being withdrawn.

Methods Used. There are three general methods of shaping glass, blowing, pressing and casting. Bottles, window glass, vases and the most expensive tableware are blown. The glass blower uses only a few tools of the simplest patterns and depends almost entirely upon his skill to obtain the desired results. He gathers on the end of his blowpipe, which is a straight iron pipe about four feet long, a sufficient quantity of melted glass to make the article desired, then by blowing into this, rolling and swinging the pipe and using such tools as calipers and burnishers, he proceeds to fashion the object. In blowing window glass, the workmen stand upon a bridge over a trench, which is several feet deep, and they use larger and longer blowpipes than those used in making small articles. The workman gathers upon his blowpipe from twenty to twenty-five pounds of glass. By blowing into this and swinging his pipe, he causes this mass at first to take on a shape resembling a pear; then by holding his pipe upright and blowing into the glass and rotating the pipe, he changes the pear into the form of a cylinder. When the cylinder has been perfected its ends are cut off, and it is laid upon a table and scratched lengthwise with a diamond; it is then cut in two on the side by laying a cold iron over the mark. The open cylinder is placed in the flattening furnace, where, as it softens, a workman flattens it by pressing it down upon a table with a piece of charred wood attached to a long handle. This makes a pane of glass about forty-five inches long and thirty-six inches wide. During the World War American manufacturers experimented successfully with the automatic manufacture of window glass in a continuous sheet.

Kinds of Glass. Owing to the different substances used in its manufacture, the various proportions in which these may be combined, and the different methods of manufacture, there are many different varieties of glass.

Colored Glass. However strange it may seem to us, the glass made by the ancients was colored. Originally this coloring was probably due to the impurity of the materials used. Later it was discovered that different colors could be produced by mixing certain substances with those ordinarily used in the manufacture of glass, and all colored glass made at the present time is produced in this way, the oxides of metals being used for most of the colors. Every conceivable tint is now possible for makers to produce.

Outline on Glass

I. Uses of Glass
  (1) In the home
  (2) In industry and the arts
  (3) In science
II. Manufacture
  (1) Types of furnace
  (2) Ingredients
  (3) Preparation of material
  (4) Methods
III. Kinds of Glass
  (1) Colored
  (2) Ornamental
  (3) Bottle glass
  (4) Pressed
  (5) Plate
  (6) Flint
  (7) Cut
IV. History
  (1) Ancient
  (2) Modern

Questions on Glass

What is glass?

How is window glass made? How cut? How flattened?

How are bottles made?

How is cut glass made? What makes it so expensive?

How is stained glass made?

When and where was glass first used for windows?

What fuel is used in the furnace in making glass?

Why should the raw materials be pure?

How is coloring in glass produced?

What are the leading countries in the manufacture of glass?

To what is due the softness and brilliancy of plate glass?

Why are glass factories most numerous in the gas belts of the country?

How many pounds of melted glass does the blower gather at the end of his pipe? How does he shape it?

How is lettering placed on bottles?

A pale yellow or pale green is produced by oxide of iron, and a pink, amethyst or violet by manganese. Copper produces deep blue or deep green, but a ruby-red color may be imparted by the addition of a reducing agent to take the oxygen from the oxide. Cobalt oxide gives a rich blue, tin oxide a milky white, and other beautiful tints result from combinations of various sorts.

Ornamental Ware. There are many methods of making ornamental glassware. Sometimes the glass is colored by dipping a transparent glass into colored glass when the latter is in a molten state. Figures worked into vases and other articles, as shown in Figs. 6, 7, 10 and 11 in the accompanying color plate, are usually made by working the colored glass into the glass forming the body of the object. This is usually done by placing the figures upon the outside of the vessel and then subjecting the glass to such heat as will partially fuse it. The figure then sinks into the body of the glass and blends with it. Other beautiful effects, such as are shown in Figs. 4 and 9, are produced by blending glasses of different colors, either in the manufacture of the article or in the material from which it is to be made. For the method of making colored glass windows, see article on Stained Glass.

Bottle Glass. See Bottle.

Pressed Glass. Much of the table ware and many other small articles are made by pressing the glass in molds. The mold is of iron or steel and contains any ornamental designs which the article is to take. A sufficient quantity of melted glass to make the article is dropped into the mold, and then a plunger, which forms the inside of the article, is forced down upon it. This presses the glass into every part of the mold and impresses upon it the desired design.

Plate Glass. Plate glass is made by casting on an iron table. The melted glass is poured onto the table, which has a steel rim rising above the surface to the height of the desired thickness of the glass. As the melted glass is poured, a heavy roller is passed over it, forming the plate. The peculiar softness and brilliancy of plate glass are due to the purity of the material used and the polishing which the glass receives.

Flint Glass. This is a variety in which potash and pure sand are used, making it particularly clear and transparent. It is used for the best articles of table ware and in the manufacture of small bottles, vases and other smaller articles.

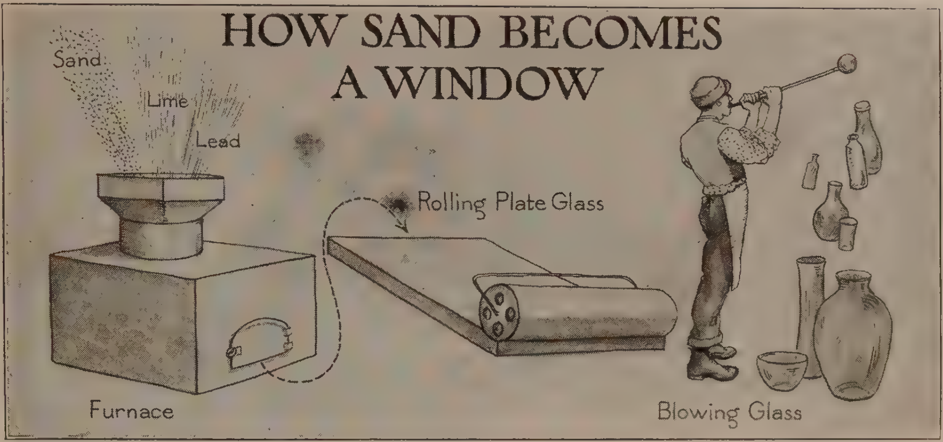
Cut Glass. This is made by grinding the best quality of blown glass on wheels, over which flow streams of water and sand. This glass is prized for its brilliancy and is very expensive, as it requires the service of highly-trained workmen.

History. Glass has been in use for so many centuries that we do not know when it was first manufactured. Tombs of the ancient Egyptians which were built more than 3,000 years B. C. show glassblowers at work, and specimens of glass that were made more than 2,000 B. C. have been found in other tombs of these ancient people. The Chinese and other peoples of the East also became very skilful in the manufacture of glass before the Christian Era. Vases, pitchers and other ornamental vessels found among the ruins of the buried cities in Greece and in Asia Minor, show that the Greeks and other ancient peoples of this part of the world were well acquainted with the manufacture of glass. The earliest use of glass was for ornamental purposes, and all of the articles which have been discovered in the ruins of ancient cities are of colored glass. The use of glass for windows is of more recent origin. As far as known, it was first used for this purpose in England in the latter part of the seventh century, but its use was restricted to colored glass which appeared in cathedral windows.

Before the World War the United States imported yearly about $8,000,000 worth of glass, and exported glass products having a value of about $3,800,000. During the war American manufacturers vastly increased their equipment and output, and the United States became one of the great exporting countries. Special progress was made in the manufacture of optical glass, watch crystals, oven glass, photographic glass and laboratory and chemical ware, which previously had been largely furnished by Germany. At the close of the war it was announced that the phosgene gas manufactured for military purposes had powerful bleaching properties, and would be used in bleaching sand used in the manufacture of optical lenses.

GLASS SNAKE, a lizard of snakelike appearance, whose name refers to its habit of stiffening when frightened, and snapping off its tail. The creature is about twenty-seven inches long, and three-fourths of an inch in

HOW SAND BECOMES A WINDOW



What fairies have waved their magic wands to bring clear, transparent glass out of a mass of sand, lime, soda, lead, or other materials? Heat and Chemical Reaction are the spirits who perform these and countless other wonders. Under their touch these materials give up their own forms and characters and are lost, while in place of them appears a new and crystal pure substance. And think how, by the aid of glass, we can explore the world of the invisible! The good fairies we have named and many others out of the mysteryland of "Science" are Man's most faithful servants, and come and go and work as he directs. The tales of magic in which we revel as children do but foretell the real things that Man is having done for his benefit every day.

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A ladle of molten glass just drawn from a tank furnace. In this furnace a heat of 2600° F. is kept constantly, day and night, for months at a time, while raw materials are fed in regularly at one end and the molten glass is drawn off just as regularly at the other. By varying the kind or amount of the materials used, every possible sort of glass can be made; six inches or more thick, or as thin as the dragon fly's wing; as pure as the air, or with all the colors of the rainbow softly blended; in forms and designs and for uses innumerable.

The ladle has been brought from the furnace by an overhead trolley, and the glass is to be poured out on the casting table. As soon as it has spread over the table, the heavy steel roller will smooth it out, forming the plate that may become a window of "the largest department store in the world." When the plate becomes hard it is taken on a stone slab into a long, low tunnel, hot at one end and cold at the other, and it passes down this tunnel very slowly, cooling and annealing. Glass in the making must be handled like a baby.

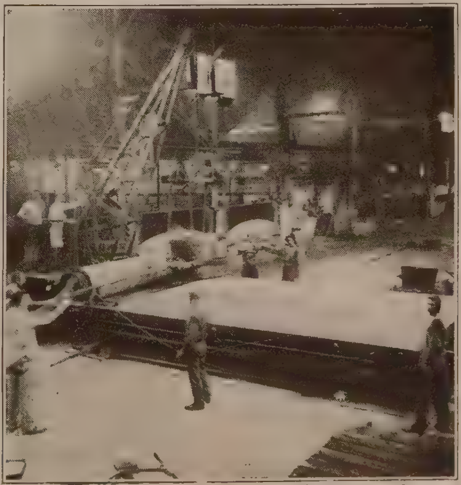

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Photo from Keystone View Co., Inc.

After the grinding plate glass must be smoothed and polished to give the soft and brilliant surface which we know so well in the large windows of city stores. After all the work that has been put upon it, we do not wonder that plate glass is insured.

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Common bottles are made in machines by blowing the molten material into moulds by compressed air. These bottles, if allowed to stand, would cool unevenly, from the outside first, and might fly into a thousand pieces. This boy stands ready to start them on their slow journey down the annealing tunnel.

Plate glass must be ground carefully that it may be of even thickness and be without imperfection. On this steel table the plate is laid, then the table is run under the grinding machine. Glass is one of the hardest substances in common use, but we know it can be worn down by steady rubbing.

Photo from Keystone View Co., Inc.

Blowing glass is a most fascinating process. The skilled workman can produce any shape desired, from the big carboys that hold acids, to the fragile instruments of the laboratory. He may blow a long cylinder which later will be flattened out for ordinary window glass, or a string of delicate beads.

Photo from Keystone View Co., Inc.

diameter. Its skin is a shining olive, brown or black. The glass snake is found in many parts of the world.

GLAUBER'S, *glow'burz,* **SALT**, the common name for sodium sulphate, a white crystalline compound with a bitter, salty taste. When exposed to the air its crystals turn to a white powder. It was originally prepared by a seventeenth century chemist named Glauber, whose name was given to it. Glauber's salt is used as a purgative in medicine, chiefly in veterinary practice. It is also used in glass manufacture and in fixing lead mordants in dyeing and printing. This salt is found native in many localities, occurring in large colorless prisms. It is also a constituent of mineral waters, and it exists in small quantities in the blood.

GLAZING. See POTTERY.

GLENS FALLS, N. Y., in Warren County, sixty miles north of Albany, on the Hudson River and on the Delaware & Hudson and the Hudson Valley railroads. The falls in the river supply power for factories, the most important of which are lime and cement works, lumber mills and manufactories of paper, shirts, collars and other goods. A local insurance company has a fine business home, and there is a public library, a hospital, a state armory, an academy and two parks. Glens Falls was settled in 1763, Population, 1910, 15,243; In 1920, 16,591, a gain of 9 per cent.

GLOBE. In geography and astronomy, the word is applied specifically to an artificial sphere, made of metal, plaster, paper or pasteboard, on the surface of which is drawn a map or representation of either the earth or the heavens. The former is called the *terrestrial globe,* and the latter, the *celestial globe.* In the terrestrial globe the wire on which it turns represents the earth's axis, the extremities of it representing the poles. On the surface of the globe, as on other maps, are marked parallels of latitude and meridians. When the meridians are drawn through every 15° of the equator they are sometimes called the *hour circles,* since each two meridians mark points differing by one hour in time.

GLOBE, ARIZ., in Gila County, 575 miles east of Los Angeles, on the Arizona Eastern Railroad. It is in a copper region, and also in a section where cattle raising is profitable. The great Roosevelt Reservoir is near here, as is also the Apache Trail and some of the homes of the ancient Cliff Dwellers. In 1918 a Federal building was constructed, and there are a number of other new and pretentious buildings. There is a public library, and the town has two hospitals. Population, 1920, 7,044.

GLOUCESTER, *glahs'ter,* ENGLAND, the capital of Gloucestershire, is situated on the left bank of the Severn, thirty-three miles northeast of Bristol. The ancient Roman ground plan of the city is still seen in the four streets meeting at right angles in the center of the town, at what is called the *cross.* Remains of Roman walls are to be seen in many places. Among the buildings of interest are a deanery, the New Inn, the episcopal palace and the new guild hall. The nunnery, which existed as early as the seventh century, was supplanted by a monastery about 820, which was in turn followed by a great Benedictine Abbey. This abbey became the center for the cathedral, which was built from 1088 to 1498. Gloucester has engineering works, flour mills, iron foundries, shipbuilding yards and manufactories of chemicals, cutlery, agricultural implements and soap. The commerce is important, trade being facilitated by a canal leading from the estuary of the Severn to the city docks. Population, 1914, estimated, 50,558.

GLOUCESTER, MASS., in Essex County, thirty miles northeast of Boston, on Cape Ann, Massachusetts Bay, and on the Boston & Maine railroad. There is an excellent harbor, and the fisheries, which are the largest in the United States, include cod, herring, haddock, halibut and mackerel; over 5,000 men are engaged in the industry. There are also shipbuilding yards, quarries of granite and manufactories of clothing, shoes and cigars. The first permanent settlement was made in 1633, and it was chartered as a town in 1642 and as a city in 1873. The importance of the town dates from the beginning of the eighteenth century. Population, 1910, 24,398; in 1920, 22,947, a decrease of 6 per cent.

GLOVE, *gluv,* a covering for the hand, with a separate sheath for each finger. Gloves have been used since very ancient times and were probably known to the prehistoric cave-dwellers. The Greeks used them for protection; the Romans, for ornament. In the Middle Ages gloves came to have a symbolical significance. They were offered as gages in courts of law and in making a challenge to a combat at arms. A leather glove was worn inside of metal armor to prevent chafing of the hand. In the fifteenth century gloves came into general uses in parts of Europe and in England.

Gloves are made of leather, fur, cotton, linen, silk and worsted. The chief leathers used in glove manufacture are buck, calfskin and sheepskin, for military gloves; lambskin, for most of the so-called kid gloves; real kid, for the best and finest gloves; dog, rat and kangaroo skins, for other grades. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes. Leather gloves are usually cut out by means of dies and are sewed by machinery. The best woolen, thread and silk gloves are made by cutting and sewing, but cheaper grades are made by knitting and weaving. France supplies the world with most of the finer and more expensive gloves, but the United States leads in the manufacture of men's gloves, and the center of the industry is in Gloversville, Fulton County, N. Y. About four million dozen pairs of leather gloves and mittens are made in the United States each year.

GLOVERSVILLE, *gluv′urz vil,* N. Y., in Fulton County, fifty-four miles northwest of Albany, on the New York State Barge Canal and the Fonda, Johnstown & Gloversville railroad. It is the most extensive glove manufacturing center in the world, producing, with its neighboring city of Johnstown, more than half the entire output of the United States. There is a Federal building, a Carnegie Library, an Old Ladies' Home and a public playground. The place was settled at the beginning of the Revolution and was known as Stump City until 1832. It was chartered as a city in 1890. Population, 1910, 20,642; in 1920, 22,026, a gain of 7 per cent.

GLOW′WORM. See FIREFLY.

GLOXINIA, *gloks in′i a,* a dainty hothouse plant prized for its ornamental foliage and richly colored trumpet-shaped flowers, which terminate in several spreading lobes. It is a native of the tropics, but has long been successfully cultivated in northern greenhouses. The plant requires a light soil.

GLUCK, *gluk,* ALMA (1886–), a popular American dramatic soprano and concert singer. She was born in Bucharest and at the age of five emigrated with her parents to New York. From 1906 to 1909 she studied vocal music, but with no expectation of a professional career. In the latter year she sang for the director of the Metropolitan Opera House, who offered her an engagement. Except for a year in Berlin as a student of Madam Sembrich, she has since been singing in opera and in concert almost continuously. In 1914 she married the Russian violinist, Efrem Zimbalist.

GLUCK, CHRISTOPH WILLIBALD (1714–1787), the first German composer to attempt to reform the opera, and the father of modern music-drama. He was born in Bavaria, and was largely self-taught. In his first opera *Artaxerxes,* written in 1740 for the court theater of Milan, he departed from the old school which conceived opera as a mere concert in costume. Coming under Handel's influence, he developed a lyric power which created a new order of musical composition. His first great opera *Orpheus and Euridice,* was given its first public performance in 1762, and *Alcestis* was produced four years later. Whereas in earlier operas any unplausible plot was considered good enough as a basis for opera, and any rhyming stanza, however stupied its content, was thought a suitable peg on which to hang a song, in the opera of Gluck the libretto was true poetry, and the music expressed, or rather intensified, the emotion or thought the words conveyed. Gluck composed fifty-four dramatic works, the best of which is *Iphigenia in Tauris.* Other notable works were *Iphigenia in Aulis, Paris and Helen* and *Antigone.*

GLOXINIA

GLU′COSE, a syrup manufactured from the starch of corn. The corn is soaked for two or three days in water containing a small quantity of sulphurous acid, then ground into a coarse meal and treated with a mixture of starch and water. This causes the germs to float to the surface, while the heavier portion, containing the starch, settles. The germs are skimmed off and used in making corn oil. The starch is separated from other parts of the crushed corn by washing. Glucose is made from the starch by treating it with water and hydrochloric acid in steam-heated, closed vessels, called *converters;* sulphuric acid is used for some grades. The process requires from ten to thirty minutes, according to the grade of glucose required. When the liquid leaves the converter, the acid is removed by chalk or marble, if it is sulphuric, or by soda, if hydrochloric. The glucose is then filtered and boiled until the desired consistency is secured.

Glucose is considered a healthful food and is used for canning fruits and in making jellies and confectionery. It was found to be a very desirable substitute for sugar in candy making during the World War, when there was a serious sugar shortage. The manufacture of glucose has become an important industry in the United States, and the country now exports many million dollars' worth each year. See CORN.

GLUE, an animal cement, made from the parings of hoofs and from the hides, tails and bones of animals; the best glue is obtained from the true skin. The parts are first thoroughly cleaned by soaking them in lime water, which process requires at least ten days; then they are boiled in soft water for several hours, until the glue is extracted. The liquid is then drawn off and allowed to cool. As the glue becomes solid it is cut into cakes, which are cut by wires into thin sheets. These are again cut into pieces about four inches square, then thoroughly dried and packed for shipment. White glue is bleached, but common glue is of a dark brownish color. Fish glue is made from the heads, offal and scales of fish. Glue is used for sticking pieces of wood together; in making ink rollers for printing presses; in thin solutions, for sizing paper and cloth; in calico printing, and in kalsomining. Peter Cooper, in 1837, made the first American glue. See GELATIN.

GLUTEN, *gloo′ten,* a tough, elastic substance of a grayish color found in the flour of wheat and other grains. A similar substance is found in the juices of certain plants. The gluten in wheat has a high degree of tenacity and imparts to bread dough that toughness and stickiness which enables it to hold the gas bubbles created by yeast. Light, porous bread is the result. For this reason wheat flour is the most popular brand for bread. There are, on an average, eight pounds of gluten to one hundred pounds of flour.

GLUT′TON, the English name for the European flesh-eating animal which is known in the United States as the *wolverine.* The animal is slow, but persevering, cunning, fierce and of great strength, and is famous for its voracious appetite for putrid flesh. The fur, which is shaggy and dark brown, is valuable, that from Siberia being preferred because of its glossiness.

GLYCERINE, *glis′ur in,* a transparent, colorless liquid, obtained from the byproducts of candle and soap factories, or made directly by decomposing fats with steam under pressure or with lime. It is as thick as syrup, has a sweetish taste and at a low temperature crystallizes into a solid mass. It absorbs moisture from the air and dissolves in, or mixes with, water and alcohol in all proportions, but it is insoluble in ether. It acts as a solvent on both inorganic and organic bodies. The uses of glycerine are very numerous. In the arts it is used wherever a substance requires to be kept moist. It is also used in the preparation of tobacco, as an ingredient of inks and oils, in making cosmetics, toilet soap and printers' ink rolls, and in spinning, weaving, rope making and tanning. It is an excellent preservative medium for meat and for natural history specimens; and its property of lowering the freezing point of water makes it useful in gas meters, floating compasses and similar instruments. It is also extensively employed in the manufacture of nitroglycerine (which see).

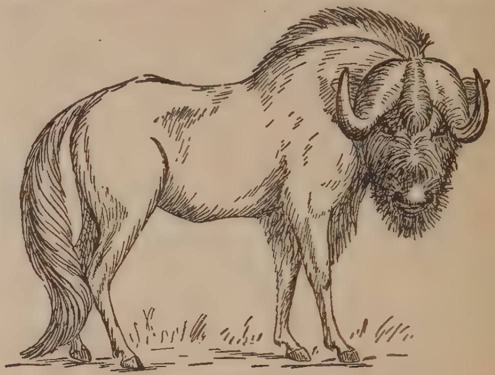
GLYN, *glin,* ELINOR, an English novelist who became widely known in 1907 through the publication of a sensational book entitled *Three Weeks.* It awakened more discussion than it deserved from a literary standpoint, and was dramatized successfully. Several other books of the same type followed, including *The Reason Why, His Hour, The Sequence* and *The Career of Katherine Bush.* Though Mrs. Glyn's books are popular with those who enjoy sensation, they have no distinction of style or subject matter, and their moral tone is low. The author is the daughter of Douglas Sutherland, of Toronto, Canada. In 1892 she married an Englishman, Clayton Glyn. Her permanent residence is in France.

GNAT, *nat*, a general term applied to a number of different insects, of which the most common is the mosquito. Some species are so minute as to be almost invisible, and as the stings they inflict are highly annoying and irritating and the insects appear sometimes in countless thousands, they render life almost intolerable in some localities. See MOSQUITO; HESSIAN FLY.

GNEISS, *nise*, a rock of almost the same composition as granite, but having a layer formation. Quartz, feldspar and mica predominate in it, and there are numerous accessory minerals. The layers, whether straight or curved, are frequently thick, but often they vary considerably in the same specimen. Gneiss is rich in metallic ores, such as gold, silver, cobalt, antimony, copper and iron, but it contains no fossil remains. Porphyritic gneiss presents large, distinct crystals of feldspar, which traverse several of the layers. Gneiss often contains hornblende, in place of mica, and then receives the name of syenitic gneiss. It is the principal rock of some regions; it predominates in Norway and Northern Europe, and abounds in the Southern Alps and the Pyrenees and forms the loftiest chains of the Andes near Quito. In the United States, gneiss is a common rock, especially in New England and the eastern and southern parts of New York. See GRANITE; MICA.

GNOMES, *nomes*, in folklore, a name given to fairies who were supposed to guard the veins of precious metals in the earth. They are usually pictured as bearded dwarfs, clad in close-fitting brown garments and hoods. They served as smiths for the gods, and mined gold, silver and precious stones. They were condemned to live underground all their lives; if they appeared in daylight they were turned to stone. See FAIRIES.

GNU, *nu*, the name given to two quite remarkable species of South African animals which appear to be part antelope, part buffalo and part horse. The gnu of either sex has horns projecting slightly outward and downward, then bending abruptly upward, so that the head looks like a buffalo's. It has bristly black hair about the face and muzzle, a white, stiff mane and horselike tail. The animal is about nine feet long and stands about four feet high at the shoulder. Gnus live in herds and are said to be fierce when attacked, but when taken young they have been found capable of domestication. When alarmed, either species will wheel in a circle once or twice before running away.



GNU

GOAT, in some parts of the world one of the most valuable of animals, for it provides milk and flesh for food and skins and hair for clothing. In North America and Great Britain there is a prejudice against goat's milk, but it is sweet and nourishing, and justifies the term, "the poor man's cow," which is applied to the animal. India possesses about 32,000,000 goats; South Africa, 12,000,000; Argentina, 4,000,000, and there are about the same number in Algeria, Spain, the United States and Italy. Before the World War Germany had 4,000,000.

ANGORA GOAT

Goats are easy to keep, for they can live on food which other animals refuse to eat; they like the branches and leaves of shrubby plants, and they graze as do sheep. English-speaking people do the goat an injustice when they include tin cans in its diet, but the statement emphasizes the wide range of its food.

The goat belongs to the sheep family. It has hollow, erect horns, curved backward, and the male is bearded. While about the size of sheep, goats are not timid; they use their heads and horns for attacking enemies, and they are stronger and more agile than sheep. They are often kept as pets, and children harness and drive them. The skin makes the finest varieties of leather, and for leather manufacture the United States imports $25,000,000 worth of skins every year.

The Angora goat (illustration above) is the aristocrat of the family. Its hair is white, fine and silky, and curls in ringlets from ten to fifteen inches in length. The Angora fleece is called mohair (which see).

GOAT′SUCKER, or **NIGHT′JAR**, a European bird, remarkable for its very flat head and wide mouth. It has large eyes and speckled feathers. It spends the winter in Africa and crosses the Mediterranean late in the spring. It passes the day in slumber and at twilight begins to hunt its prey—moths, cockchafers, and the like. The name arose from the old absurd belief that the bird milks goats. The strange leaping movements of these birds near the ground, their large mouths and their manner of seeking their prey near the ground and in pastures where domestic animals graze may have given rise to the notion. The bird makes no nest, but lays its eggs on the sand or in the grass. It is related to the American nighthawk and whip-poor-will.

GOBI, *go′be*, an immense tract of desert country, occupying nearly the center of the high tableland of Eastern Asia, and extending over a large portion of Mongolia and Chinese Turkestan. Its length is probably about 1,800 miles, its mean breadth between 350 and 400 miles, and its area 300,000 square miles. Its general elevation is over 4,000 feet above sea level. The East Gobi is occupied by different tribes of the Mongolian race, who have numerous herds of camels, horses and sheep. This tract is supposed at one time to have been a great inland sea. See DESERT.

GOD, a term applied to the Supreme Being who is conceived to be the creator and ruler of the universe. When the word is spelled with a small *g* it refers to one of the numerous deities which figure in the religions of primitive peoples of to-day or to one of the superhuman beings of ancient mythology (see MYTHOLOGY). The Hebrews were the only ancient people who conceived of a world governed by one God, but originally Jehovah was to them a tribal God who cared only for the Israelites; they did not think of him as the Father of all the human race. The present conception of a God who loves all peoples alike has developed from Christianity, for Christ taught very clearly the idea of the universal Fatherhood of God.

The existence of God is not, however, universally acknowledged. There are those who deny that such a Being exists, arguing that no concrete proof can be given for belief in His existence. Such persons are called *atheists*. Another group, composed of those who argue that one can neither prove nor disprove the existence of God, are known as *agnostics*. The arguments of believers are in the main as follows: the fact that the whole universe and all parts of it are governed by natural laws proves that a supreme mind is back of everything; the presence in man of a moral nature shows that there must be a higher moral force; in nature all forms of life are adapted to their environment, and this design in nature proves the existence of God. Belief in the supernatural seems to be an almost universal instinct of the human race, and it is undoubtedly true that the majority do not require a concrete, tangible proof upon which to base such belief. See AGNOSTICISM; ATHEISM.

GOD′ERICH, ONT., the county town of Huron County, on Lake Huron, at the mouth of the Maitland River. It has one of the best harbors on the east shore and has good railroad connections through the Canadian Pacific and Grand Trunk railways. The neighborhood supplies limestone, salt, lumber, glass-sand and clays of various kinds, and there are two concrete elevators. The manufacturing interests are extensive, the industries being chiefly dependent on raw materials from the vicinity. There is also shipbuilding. Population, 1916, 5,000.

GOD′FREY DE BOUILLON, *de boo yoN′*, (about 1058–1100), duke of Lower Lorraine and one of the leaders of the First Crusade. When Jerusalem was conquered and a Christian state founded, Godfrey became ruler, with the title Baron. At Ascalon with twenty thousand men he defeated the sultan of Egypt with four hundred thousand, and he then devoted himself to the organization of his government and drew up for his courts of justice a code of laws which was a complete embodiment of feudal jurisprudence. He was buried on Mount Calvary.

GODI'VA, Lady, the heroine of a well-known English legend. She was the wife of Earl Leofric, Lord of Coventry, a merciless baron of the eleventh century. When he heavily taxed the people of the town she begged him to lighten their burdens. The Earl promised that he would do so if she would ride naked through the principal streets. Lady Godiva, not dismayed by this condition, sent out a proclamation asking all the people to remain at home on a certain day, and not even to look out of their houses. On the appointed day she mounted a white horse and rode through the streets, her naked body covered only by her long hair. Only one man, a tailor, allowed his curiosity to get the better of him, but when he peeped at her through a hole in his shutter he was struck blind. The "Peeping Tom" tradition is probably based on this episode of the legend. For many years it was customary to celebrate the legend at an annual fair.

GOD SAVE THE KING, the national anthem of Great Britain, probably written in 1743, after the victory of George II over the French at Dettingen. It is claimed that Henry Carey was the author of both words and music, but there is evidence that the hymn was adapted from a much older tune. The same music has been used for a national air in Germany and one in Russia, while in the United States one of the most popular of patriotic songs, *My Country, 'Tis of Thee,* is sung to it.

The three stanzas of the anthem are given below:

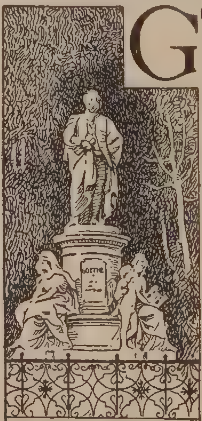
God save our gracious King,
Long live our noble King,
God save the King!
Send him victorious,
Happy and glorious,
Long to reign over us:
God save the King!

O Lord our God, arise!
Scatter his enemies,
And make them fall!
Confound their politics;
Frustrate their knavish tricks;
On Thee our hopes we fix:
God save the King!

Thy choicest gifts in store
On him be pleased to pour;
Long may he reign,
May he defend our laws,
And ever give us cause
To sing with heart and voice:
God save the King!

GOETHALS, *go'thalz,* George Washington (1858-), an American soldier and engineer, and renowned constructor of the Panama Canal, was born in Brooklyn, New York. He was graduated from the United States Military Academy at West Point in 1880, was immediately appointed second lieutenant of engineers, and by 1909 had attained the rank of colonel in the engineer corps. He was chief of engineers during the Spanish-American War, and after February, 1907, was in complete charge of all work on the Panama Canal, which his engineering skill and administrative ability successfully hastened to completion. In 1914 he was made first governor of the Canal Zone, and in 1915 was raised to the rank of major-general by special act of Congress.

In 1915 Goethals was appointed chairman of a committee to investigate the effects of the Adamson Railroad Law, by which hours of labor and wages were radically changed. Upon completion of that task he was released by the government to construct good roads throughout New Jersey, but was recalled to supervise the construction of a vast merchant marine for the United States after the nation entered the war against Germany. Disagreement with his associates led to his retirement from the post, after which he became acting quartermaster-general of the American army. In March, 1919, he returned to civil life as a retired officer of the army, and the following month he went to Europe as a representative of an engineering firm to engage in reconstruction work.


Statue in Berlin

GOETHE, *gö'té,* Johann Wolfgang von (1749-1832), the greatest figure in German literature, a dramatist, lyric poet, novelist and philosopher. He is to Germany what Shakespeare is to England and Dante is to Italy. Goethe was born at Frankfort-on-the-Main, August 28, 1749, the son of a man of wealth, education and position. At an early age the boy learned the French language, and a French theatrical company, performing at Frankfort, awakened his taste for the stage. Drawing, music, natural science, the elements of jurisprudence and the languages occupied him until, in 1765, after the breaking off of a youthful love affair, he was sent to the University of Leipzig to prepare himself for the legal profession. An illness forced him to return home, and when he resumed his law studies it was at the University of Strassburg, where, in 1771, he took his degree of Doctor of Jurisprudence. At Strassburg he became acquainted with Herder—a decisive circumstance in his life, as Herder helped him to free himself from the restraints of French classicism and inspired his mind with views of poetry more congenial to his character than any which he had hitherto conceived.

After taking his degree he went to Wetzlar to practice law. While there he fell in love with a young lady who was betrothed to a friend of his, and in consequence he soon left Wetzlar. This was the experience which formed the basis of his *Sorrows of Werther.* The attention of the public was first forcibly attracted to him by his drama *Götz von Berlichingen,* which appeared in 1773, and in the following year he became world-famous on the publication of *The Sorrows of Werther.*

GOETHE

Not long after the publication of this work, Charles Augustus, the hereditary Duke of Saxe-Weimar, made the acquaintance of Goethe, and when he took the government into his own hands, he invited Goethe to his court. Goethe accepted the invitation, and late in 1775 he arrived at Weimar. Wieland was already there, having been the duke's tutor; Herder was added to the band in 1776; Schiller was afterward one of its members for a few years; and other poets, critics and novelists were gathered round these chiefs. Goethe was the leading spirit of the group even during the last quarter of the eighteenth century, when these men and others were constructing and guiding the literature of all Germany; and his supremacy became yet more absolute afterward, when for another generation he stood alone. In 1786 he set out on a journey to Italy, where he remained two years. This residence in Italy had the effect of developing still further his artistic powers. Here his *Iphigenie* was matured, *Egmont* was finished and *Tasso* was projected.

In 1790 was published the earliest form of the first part of *Faust,* which belongs rather to Goethe's whole life than to any particular period of it. At the time that Goethe was engaged in the production of these works he had been pursuing various other studies of a scientific nature with ardent interest. The result of his studies in botany was a work in which he gives expression to the view that the whole plant and all its different parts may be regarded as variously modified leaves. In the following year (1791) he began to apply himself to optics, and he published a work on this subject also. In 1791 he became director of the court theater at Weimar, and his work here, with the production of *Wilhelm Meister,* occupied him until 1792, when he followed Charles Augustus during the campaign of the Prussians against the revolutionary party in France. In 1794-1796 Goethe published *Wilhelm Meister's Apprenticeship,* a novel which has become well known to English readers through the translation of Carlyle and which contains some of the most beautiful songs ever written. His next work of importance was *Hermann und Dorothea* (1797), a narrative poem in hexameter verse, the characters of which are taken from humble life. In 1806 Goethe married Christiane Vulpius, with whom he had lived since 1788 and of whom he always spoke with warmth and affection. In 1809 was published *Elective Affinities,* another novel, and between 1811 and 1814 appeared his autobiography, one of the finest autobiographies in any language. The *Westöstlicher Divan,* a remarkable collection of Oriental songs and poems, appeared in 1819. Goethe's last work was the second part of *Faust,* completed in 1831.

GOI'TER, or **GOI'TRE,** a disease which is marked by the swelling of the thyroid gland, situated in the front of the throat. It affects women more frequently than men, and seems to be most common in localities where there are lime formations that affect drinking water. The carrying of heavy weights is known to be one cause of goiter, and others include inheritance, nervous shock and worry. Removal of the growth by a surgical operation is advisable in some cases; electric treatment and applications of iodine are also helpful. Each case should be treated as recommended by a reliable physician.

GOLCONDA, *gol kon'dah*, an ancient city of India, which was situated midway between Madras and Bombay. The ruins include the burial places of the ancient sovereigns of the kingdom of Golconda, and an ancient fortress, which is now used as a state prison. Golconda was famous for diamonds, which, however, were probably found in the territory to the south of the city, and were merely cut and polished at Golconda. The industry perhaps gave rise to the proverbial expression, "richer than Golconda."

GOLD, the most precious of metals, the one most sought in all regions of the earth from the earliest times, and because of its desirability and worth the standard by which all values have been measured. Proof of the extraordinary place it held among peoples of the most ancient times is abundant. Egyptians and Assyrians fashioned wonderful ornaments from it. The Hebrews put their faith in gold, but the Psalmist, employing a comparison that touched them vitally, warned them of things that were "more to be desired than gold, yea, than much fine gold." Exploration of new lands, particularly America, was hastened by Spanish dreams of an "El Dorado," a region of fabulous golden wealth. Men who followed them have never ceased to search for the precious metal.

Gold is everywhere a synonym for opulence. Its possession carries benefits, yet its influence is often corrupt. Some men worship it, fight for it, die trying to accumulate it. Shelley, in *Queen Mab*, says:

Commerce has set the mark of selfishness,
The signet of its all-enslaving power
Upon a shining ore, and called it gold;
Before whose image bow the vulgar great,
The vainly rich, the miserable proud,
The mob of peasants, nobles, priests, and kings,
And with blind feelings reverence the power
That grinds them to the dust of misery.
But in the temple of their hireling hearts
Gold is a living god, and rules in scorn
All earthly things but virtue.

This most important metal is one of the heaviest of all known substances, being 19.3 times heavier than water. It is bright yellow in color, and is the most ductile and malleable of all metals. It may be beaten into leaves so exceedingly thin that one grain in weight will cover 56 square inches, and it will take 280,000 such leaves to make an inch in thickness. A single grain may be drawn into a wire 500 feet long, and an ounce of gold can be made to cover a tiny silver wire more than 1,300 miles in length. It may also be melted and remelted with scarcely any diminution of its quantity, yet it does not melt until heated to a temperature of 1945° F. It is soluble in nitro-muriatic acid, or *aqua regia,* and in a solution of chlorine, but it does not tarnish on exposure to the air.

The fineness of gold is estimated by carats, pure gold being twenty-four carats fine. Jeweler's gold is usually a mixture of gold and copper in the proportion of three-fourths of pure gold to one-fourth of copper; such a mixture is said to be eighteen carats fine. Gold ornaments only ten carats fine will not tarnish, and will wear better than those more nearly pure gold. Gold is seldom used for any purpose in a state of perfect purity, on account of its softness, but is combined with some other metal to render it harder. Standard gold, or the alloy used for the gold coinage, consists of twenty-two parts of gold and two of copper and is therefore called twenty-two carats fine.

Gold has been found in nearly all parts of the world. It is commonly found in reefs, or veins, amid quartz, and in sand and gravel; it is separated, in the former case, by quarrying, crushing, washing and treatment with mercury. The rock is crushed by machinery and then treated with mercury, which dissolves the gold, forming a liquid amalgam. The mercury is then distilled, and the gold is left behind. According to another method the crushed ore is fused with metallic lead, which dissolves out the gold, the lead being afterward separated by placing the alloy in a porous cup and heating. The lead melts at a lower temperature than the gold and is absorbed by the cup, leaving the gold free. This process is called *cupellation.* Gold is extracted from sand and gravel by washing, and is obtained in the form of dust, grains and nuggets.

In early modern times large supplies of gold were obtained from Peru, Bolivia and other new countries. Till the discovery of gold in California, a chief source of the supply was the Ural Mountains, in Russia. An immense increase in the total production of gold throughout the world was caused by the discovery of gold in California in 1848, and the opening of the equally rich gold fields of Australia in 1851. Latterly the yield from both sources has considerably decreased. Gold mines have also been extensively worked in New Zealand. In British Columbia and the Yukon are the chief Canadian gold fields, but the metal is also found in Nova Scotia, Ontario and Quebec.

The discovery of gold in the Klondike region in 1896 caused an unprecedented rush of miners to the Alaskan and Canadian fields. Saskatchewan has a few small placer mines. In the United States, apart from California, gold in considerable quantities is found in many states and territories, chiefly Colorado, Dakota, Idaho, Montana, Nevada and in Alaska. South Africa has recently taken a conspicuous position as a gold-producing country, the mines of the Transvaal being among the most valuable in the world. Natal and New Caledonia have also important gold fields. The annual production of gold for the world amounts to about $450,000,000. Of this Africa produces about $198,000,000 anually; the United States, about $93,000,000; Australasia, $56,000,000, Russia and Finland, $28,000,000; Mexico, $22,000,000; Canada, $13,000,000.

Related Articles. Consult the following titles for additional information:

Ductility
El Dorado
Gold Beating
Klondike
Malleability
Metals

GOLD BEATING, the art or process of producing the extremely thin leaves of gold used in gilding. The gold which is beaten into leaf is almost pure metal, which has been melted at a greater temperature than fusibility requires. This extra heat gives the gold a greater malleability. It is cast into bars or flat ingots and sent to the gold beater in that form. The workman rolls it into a long, thin ribbon about 2½ inches wide and then cuts the ribbon into squares. These squares are placed between sheets of peculiar paper, known as "French" paper. It looks like exceedingly close-grained oil paper, and each sheet is about five inches square. Three hundred sheets are piled on one another, and a square of gold is laid on the paper between each two sheets. This forms a book, or, as the gold beaters call it, a *cutch.*

The gold beater slips bands of parchment over the cutch, binding all the leaves with the gold squares between them into a solid block. The cutch is laid on a block of stone, which has been faced up square, and with a twenty-pound cast-iron hammer the gold beater begins to flatten out the gold. The hammer falls on the center of the cutch for a time, thus driving the gold out. The cutch is beaten until the gold has expanded to the size of the sheets of French paper. Each sheet of gold is then removed and cut into four squares, so that each sheet is evenly squared. The leaves of gold are cut with a *filling wagon,* which consists of two pieces of sharp-edged reed or bamboo, set in a frame so that the parallel cutting edges will divide the leaf into the proper size in one cut. The leaf is cut on a soft piece of leather, so that steel knives cannot be used. The leaf is handled with pincers made of boxwood. The quartered sheets are laid in the *shoder,* which is like the cutch, except that the leaves are gold beaters' skin. About 1,000 of the gold squares are placed in the shoder, and this pile is beaten with a twelve-pound hammer for an hour. Again the leaves are cut into quarters and placed in the *mold,* which, like the shoder, is made up of gold beaters' skin, and the hammer pounds it for nearly seven hours, until the gold is spread out to the size of the mold. The leaves are then ready to be cut into squares 3⅜ inches on a side and laid in books, 25 leaves to each book, 20 books to a pack, so that a pack contains 500 sheets of gold leaf.

Dentists use gold leaf for filling teeth because gold will weld into a solid mass when cold. The dentist's gold leaf is not put through the shoder and mold, but is taken from the cutch, as they use a heavier leaf than gilders, bookbinders and sign painters.

Silver and aluminum leaf are also important products and are made in the same way. Archaeologists have found gold leaf on jars and other household utensils that were made 2,000 years before the time of Christ.

GOLD COAST, a British crown colony in West Africa, extending along the Guinea coast for 334 miles and stretching inland to an average distance of 250 miles, having an area of about 80,000 square miles. The chief forts and settlements are Cape Coast Castle, Elmina, Accra (the capital), Axim, Saltpond and Winneba. The soil is exceedingly fertile, but the climate is unhealthful. The chief products are gold, palm oil, ivory, copal and caoutchouc. Population in 1911, 1,503,386. Of this number, 2,206 were Europeans.

GOLDEN AGE, the legendary period in the history of almost all races, supposed to have been a time of enjoyment and prosperity, when the earth brought forth abundantly all things necessary for comfort, and men lived together in perfect harmony. The golden age of bygone ages was always somewhere in the more remote past; it is a significant sign of the present times that men are putting the "golden age" in the future.

GOLDEN BULL, the name given to the decree issued by Emperor Charles IV in 1356, to regulate the manner of electing emperors and the number and rights of the electors. The number of electors was fixed at seven—the archbishops of Mainz, Cologne and Trèves, the king of Bohemia, the count palatine of the Rhine, the Duke of Saxony and the margrave of Brandenburg. It was provided that in case of an interregnum the administration of the Empire should lie with the elector palatine and the elector of Saxony. The vital question as to what part the pope should have in the affairs of the Empire was left untouched.

GOLDEN FLEECE, in classical mythology, the fleece of gold in quest of which Jason made the Argonautic expedition to Colchis. See ARGONAUTS; JASON.

GOLDEN GATE, THE, a channel which connects San Francisco Bay with the Pacific Ocean. It is one mile wide and four miles long and is of sufficient depth for ocean steamers. On the south shore are Forts Pointe and Mason. Drake is said to have named this channel about 1578, but J. C. Fremont in his *Memoirs* claims that he suggested the name. See SAN FRANCISCO.

GOLDEN HORN, a long, riverlike harbor, famed in history and story, on which is located the city of Constantinople (which see). It is an arm of the Bosporus, which joins the Black Sea and the Sea of Marmora. The Golden Horn is six miles in length, and has a maximum width of half a mile; 1,200 large vessels can ride at anchor within it at one time. This harbor is one of the most beautiful in the world.

GOLD'ENROD, the national flower of the United States, by common acceptance, and of at least six of the states. It belongs to the largest of all botanical families—the composite; the goldenrod group itself contains scores of species, eighty of which are found in the United States. One species follows another, and in regions where the flower is common, the fields, roadsides and hilltops are yellow with the hardy blossoms from early August until late autumn. The small golden flowers are borne in thick clusters on a slender stem, and the leaves may be feather-veined or three-ribbed. Goldenrods nearly always grow wild, as they do not take kindly to cultivation. Some species are utilized as forage plants, and the goldenrod of Canada yields a strong fiber, which, however, is not of commercial value. See COMPOSITE FAMILY; FLOWERS, NATIONAL, STATE.

GOLD'FINCH, a favorite cage bird in Europe, much loved because of its song and its fondness for those who tend it. It is a beautifully colored finch, in which red, yellow, black and white are mingled. It has been introduced into the United States, and large numbers of the birds live in the eastern sections of the country.

GOLD'FISH, a beautiful species of carp, found originally in the fresh waters of China, and now kept in aquariums. The yellow hue of these pretty creatures is the result of careful selection and breeding, as members of the original stock were greenish in color. By careful breeding of a few fish, having golden tints, the present race was developed. The Chinese have made the propagation of goldfish an art, and in China many curious specimens have been produced. They are not difficult to care for; under good conditions they may be kept for years. The water should not be too cold and should have

FANTAIL GOLDFISH

a fresh addition every day. Prepared food may be purchased at stores which sell these fish.

GOLD LACE, a fabric woven of gilded threads, used as trimming for stage garments, for designs on uniforms and liveries, and for adorning altar cloths, clerical robes, banners, etc. Gold lace thread is made in the following manner: A rod of silver is covered with gold leaf and drawn into a wire so fine that a mile of it weighs only an ounce. This delicate wire is then flattened, extended still farther and twisted compactly around a silk thread.

GOLDS'BORO, N. C., the county seat of Wayne County, fifty miles southeast of Raleigh, on the Neuse River and on the Southern, the Norfolk Southern and the Atlantic Coast Line railroads. The city is in an agricultural region and has cotton and oil mills, machine shops and manufactories of furniture, agricultural implements and other articles. It has a public park and is the location of the Eastern Insane Asylum, a sanitarium and an Odd Fellows' orphanage. Population, 1910, 6,107; in 1920, 11,296, a gain of 85 per cent.

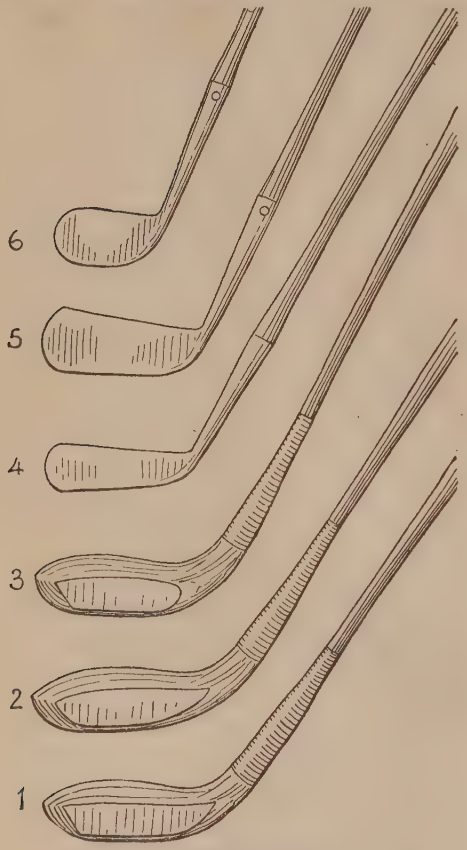
GOLD'SMITH, OLIVER (1728-1774), an Irish writer of prose and verse, born at Pallas, County Longford, Ireland. He graduated from Trinity College, Dublin, and was advised by an uncle, who had already borne a large part of the expenses of his education, to prepare for holy orders. Rejected for holy orders, he became tutor in a family, but soon had to leave on account of a dispute with the master of the house over a game of cards. He then went to Edinburgh to study medicine. Here he remained eighteen months, during which time he acquired some slight knowledge of chemistry and natural history. At the end of this period he went to Leyden, where he studied for nearly a year. Afterward he wandered over a large part of France, Germany, Switzerland and Italy. He had no money to pay his expenses during this walking tour, but his kindliness and humor won him friends everywhere, and his skilful playing on the flute gained him a scanty living.

He reached London in 1756 with a few cents in his pocket, and then followed some years of hard experience as a chemist's assistant, a medical practitioner, a proof reader and a school usher. Turning his attention to writing, he conducted a department in the *Monthly Review* and wrote essays in the *Public Ledger* and in a weekly pamphlet entitled *The Bee;* but it was not until the publication, in 1764, of *The Traveller* that he won recognition. Two years later appeared *The Vicar of Wakefield.* This novel, which to the present day is popular, was sold to the publishers for sixty pounds, that Goldsmith might obtain money to pay his landlady, who had had him arrested for debt. In 1768 his comedy entitled *The Good-natured Man* was acted at Covent Garden with but indifferent success, but *She Stoops to Conquer,* produced some years later, attained at once the great popularity which it has kept to the present day. His poetical fame was greatly enhanced by the publication of his *Deserted Village* in 1770. Goldsmith completed, as mere task-work, histories of England, Greece and Rome, and a *History of the Earth and Animated Nature,* of no scientific value. Recognized as one of the great writers of the time, he was sought after by the most famous literary men and was a member of the renowned club to which Johnson and Reynolds belonged. His last days, however, were embittered by the pressure of debt, incurred partly by his improvidence and partly by his generosity. The manners of Goldsmith were eccentric, even to absurdity; but his kindly and sympathetic nature and his rare humor always won him loyal friends. Washington Irving has written a remarkably sympathetic biography of Goldsmith.

GOLF, a popular game for both men and women, though the latter have asserted their right to play it only within recent years. Credit for the origin of golf is given to Scotland, where for several hundred years it has been played with the most punctilious observance of rules of courtesy, which has classed it from the beginning as a "gentleman's game." As it has become popularized, particularly in America, there has become noticeable in many players a certain lack of decorum and an absence of self-restraint, qualities which are designed to impart to the game a particular charm.

Golf is played in large, open spaces. A "short course" needs at least seventy-five acres; a "long course" requires not less than 150 acres. In a short course there are nine holes, or cups, which are the players' objectives; in a long course, eighteen holes. These holes are from 100 to 600 yards apart; the direction from hole to hole is immaterial, but no direct path between two holes may cross another like path.

Each hole is four and one-half inches in diameter and four inches deep, and each is marked with a flagstaff and flag or other conspicuous emblem which may be removed as players approach it. The hole is in the center of a square of perfectly smooth ground called a *green.* It was given this name from the velvety smoothness of the turf which is typical of this part of the course, and this area is thirty to forty feet square. Between the holes are broad *fairways* of smooth turf, with occasional pits of sand or long, narrow mounds of earth, interposed as *hazards.* The presence of these test the skill of the players.



GOLF CLUBS
1, Driver; 2, brassie; 3, putter; 4, cleek; 5, iron; 6, niblick.

How the Game Is Played. If played by two, the game is started by one of the players putting his ball on a little *tee,* or elevation of sand, and driving it as far as possible toward the first hole. As soon as he has played, his opponent begins in a similar manner, and from then on they play alternately from the spots where their balls lie, until both have *holed out,* that is, put their balls into the first hole. The one who does this with the fewer strokes wins that hole. The balls are then taken to a spot near the first hole, and they are driven off from a tee as before, except that the winner of the first hole is the first to play on the second. After this manner the game is continued until the nine holes are played. Two styles of game prevail. In one style the winner of the game is the person who puts his ball in the nine holes with the fewer strokes. In the other style, the person who wins the most holes wins the game. The former is known as *match play;* the latter, as *medal play.* Three or four or more may play at one time with such modifications of the rules as are made necessary.

The clubs, or sticks, are of different sizes and shapes, according to the use to which they are put. One club is designed to drive the ball a long distance; another, to raise it high in the air; a third, to take the ball out of a difficult position; a fourth, to use on the green only. Each club has its own particular name, and different players sometimes favor different clubs for the same purpose.

The ball is made of resilient composition, and is small and round and painted white, in order that it may be distinctly seen. Usually the surface is more or less roughened, so that the clubs will catch it fairly.

No one of the outdoor games has more exacting rules or is played with greater formality. There are public links in the parks of large cities; the game is also played on grounds belonging to private clubs or associations, and these are for members only. Contests are often held between different clubs, and tournaments in which several clubs take part are not uncommon. Every year a national tournament is held, and not infrequently players come from abroad to take part in these. The best players have an astonishing amount of skill, and the number of strokes required to carry the ball over difficult ground and into the hole is small.

GOLI′ATH, the Biblical giant slain by David, a native of the town of Gath (*I Sam.* XVII). His height was "six cubits and a span," which, taking the cubit at twenty-one inches, would make him a little more than eleven feet. The Septuagint and Josephus read, "*four* cubits and a span."

MAXIMO GOMEZ Y BAEZ

GOMEZ Y BAEZ, *go′mes e bah′es,* MAXIMO (1826–1905), a Cuban general, born at Bani, Santo Domingo. He served in the Spanish army, but became an opponent of Spanish rule in Cuba, quit the army and settled as a planter. During the insurrections of 1868–1878, he was an active commander of the Cuban forces. At the close of the struggle he went to Jamaica and then to Santo Domingo, but in 1895 returned to Cuba and became general in chief of the forces of the Republic. When the Americans landed in the island, he showed marked friendship and earnestly coöperated with them.

SAMUEL GOMPERS

GOM′PERS, SAMUEL (1850–), an American labor leader, one of the founders and the first president of the American Federation of Labor. With the exception of the year 1894, he has served continuously at the head of that organization since 1882. Gompers emigrated to America from England when a boy of thirteen. He was the first registered member of the Cigar-Makers' International Union, and was untiring in his efforts to strengthen the labor union movement in America.

His influence among American laboring men was directed to good purpose after the United States entered the World War, and the loyal response of the workers to their country's need had no small part in winning the war. Gompers differed from those labor leaders in Europe who favored an international conference of delegates from both allied and enemy countries, and who hoped to secure a negotiated peace. He headed a labor commission which went to Europe in 1918 to combat these ideas, and was successful in convincing French and English leaders of the necessity of a peace by victory. In 1919 he was a prominent delegate at an inter-allied labor conference held in Paris concurrently with the peace conference. His writings include *Labor in Europe and America, American Labor and the War* and *Out of Their Own Mouths.* See LABOR ORGANIZATIONS.

GONDOLA, *gon doh′lah,* a barge used on the canals of Venice, which has often been pictured in painting, song and story. No tourist ever visits the Italian wonder city without taking a ride in one of these picturesque flat-bottomed boats, with the ends curving directly upward to a sharp point. The ordinary gondola is about thirty feet long and four feet wide, and toward the middle it has a curtained compartment for passengers. The boats are painted a somber black, in accordance with an old law passed to prevent gondola owners from vying with each other in sensational decoration of their barges.

GONSALVO DE CORDOVA, *gon thahl′vo da kor′do vah,* GONZALO HERNANDEZ Y AGUILAR, about (1453–1515), a famous Spanish commander, known as the *Great Captain.* He distinguished himself in the Portuguese War, which began in 1475, and in the war with the Moors, which ended with the conquest of Granada in 1492. In 1495 he was sent to assist Ferdinand, king of Naples, against the French, and in less than a year he had driven the French out of Naples. In 1500 Louis XII of France and Ferdinand of Aragon decided on the conquest of Naples, and Gonsalvo was sent to capture the city. He was successful in this enterprise, but Spain and France could not agree as to the division of the spoils, and in a war Gonsalvo won for Spain. He was appointed viceroy of Italy, but some years later lost his office and much of his influence through the jealousy of the king.

GOOD FRIDAY, a holy day of the Christian Church, observed in memory of the crucifixion of Jesus. It is the last Friday before Easter, and has been celebrated from a very early period. In the Roman Catholic Church Good Friday is a day of fasting and prayer for all classes of people, but no mass is said. In many Protestant churches the day is observed with much solemnity.

GOOD ROADS MOVEMENT. See ROADS AND STREETS.

GOOD TEMPLARS, INDEPENDENT ORDER OF, a fraternal order, organized at Fayetteville, N. Y., in 1851. It is a temperance brotherhood, which combines the principles of teetotalism with certain rites, secret signs, passwords and insignia peculiar to itself. The first grand lodge was established in 1852. The organization consists of local subordinate lodges, county district lodges, national grand lodges and an international right worthy grand lodge. A juvenile order is also attached. In 1918 there were two national grand lodges (United States and Canada) and seventy grand lodges, with a membership of over 680,660, including 263,400 in the juvenile branch.

GOOD WILL, the benefit accruing from a business beyond the mere value of the capital, stock, funds or property employed in it. Good will arises in consequence of the general public patronage and encouragement which the business receives, due to its constant and habitual customers, or to its location, reputation and business principles. Good will costs labor and money to acquire, and is as valuable a part of a business as the stock or buildings. It is legally considered a subject of sale or disposal, along with the stock, premises, fixtures and trade debts.

GOOD′WIN, NATHANIEL CARL (1857–1919), an American actor, born in Boston. His first appearance was in a play called *Law in New York,* in which he was very successful, and his next success was *Black-eyed Susan.* In 1877 he married Eliza Weathersby. For the next fifteen years most of his work was in light comedy. After this he played *A Gold Mine, A Gilded Fool, In Mizzoura, An American Citizen, Nathan Hale, The Cowboy and the Lady, When We Were Twenty-one* and *The Genius.* He was married five times; his second wife was Maxine Elliott, a well known actress; his third was Edna Goodrich, also an actress. He was about to marry a sixth when he died.

GOODYEAR, CHARLES (1800–1860), an American inventor who patented a new process in the manufacture of rubber. He was born at New Haven, Conn. His early education was meager, and he began his career in the manufacture of hardware in Philadelphia. In his day rubber was defective in that it was stiff and brittle in cold weather and soft and sticky in hot weather. The improvement which he made consisted in mixing the rubber with sulphur and at the same time heating it to the melting point. This process is called *vulcanizing.*

Goodyear was awarded the great coronal medal at the London Exposition in 1851 and the grand medal of honor at the Paris Exposition in 1855, and was also presented with the cross of the Legion of Honor. His patents are now in general use in all countries in the manufacture of rubber, and credit is due him for discovering many practical uses of rubber. The greatest rubber company in the world, in Akron, Ohio, is named for him.

GOOSE, a large web-footed bird, related to the duck and the swan. The domestic goose, of which there are many varieties, all nearly alike, lives chiefly on land. It is valued for the table, for its quills and for its fine, soft feathers, which are used in making pillows and mattresses. A rich delicacy called *pâté de foie gras* is obtained from the livers of fattened geese. The *Canada goose* (which see) is the common wild goose of North America. In the spring these geese are seen flying northward in V-shaped flocks, and as cold weather approaches, they return to the South. Other species are the *gray goose,* or *gray-lag,* of Europe and Northern Asia, and the *pigeon goose,* of Australia and Tasmania.

GOOSE′BERRY, a low branching shrub, growing wild in Siberia, in the northern part of Europe and in North America. The branches are armed with numerous prickles and bear inconspicuous flowers and leaves having from three to five lobes. The fruit is a succulent, acid berry and much used for the table. Gooseberries are easily and extensively cultivated, and the bushes are prolific.